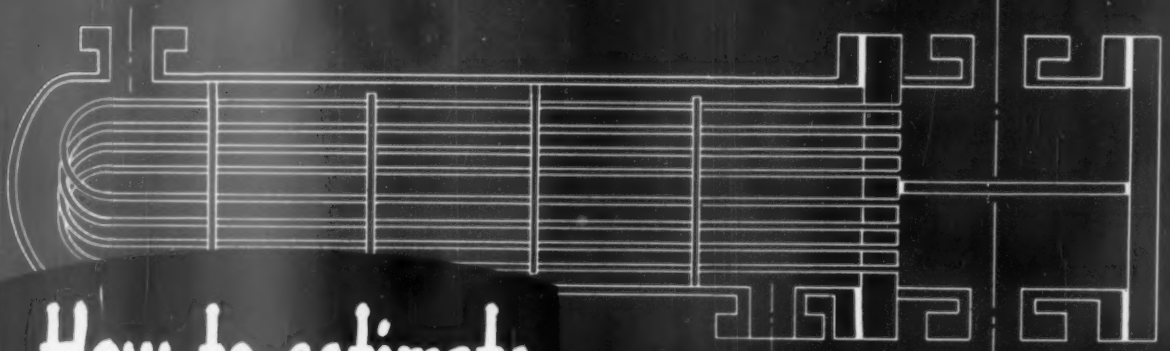
the OIL AND GAS JOURNAL
PUBLISHED WEEKLY JANUARY 18, 1960



How to estimate heat exchangers

Shortcut method for process engineers • p. 67

Costs can be cut in Texas and Louisiana ▸ 41
First of a two-part Journal study on how some oil laws encourage waste instead of conservation.

Four firms team up in Athabasca project ▸ 44

Oil's common stocks are down—but not out ▸ 46

1960 is a critical year for oil in Argentina ▸ 58

Another FIRST by LANE-WELLS

Single Line Directional Perforating for Multiple String Completions

FASTER

MORE ECONOMICAL

POSITIVE POSITIONING

SURFACE RECORDING

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UNINTERRUPTED PRODUCTION

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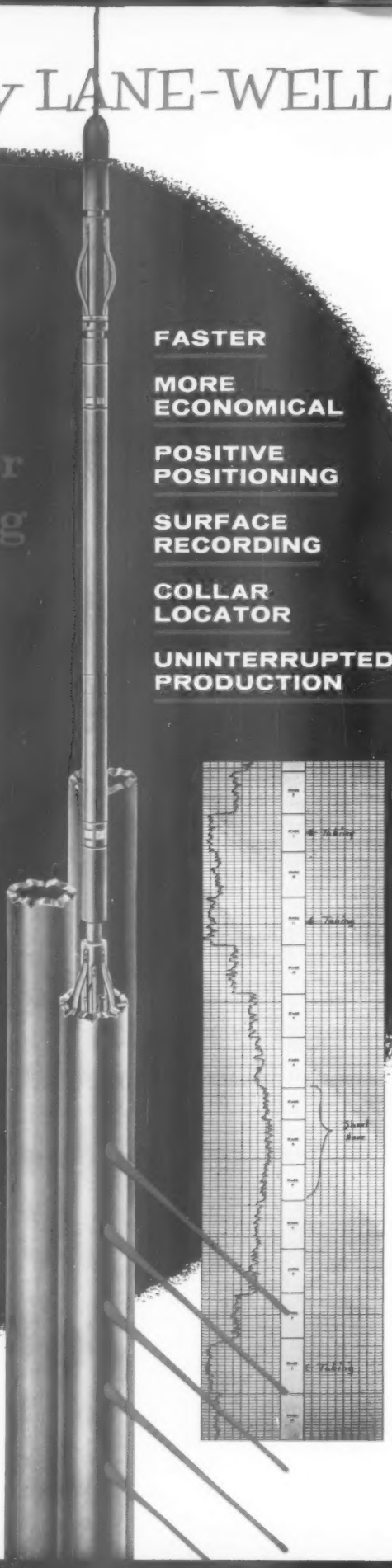

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OIL AND GAS JOURNAL
Vol. 58 No. 3

Contents January 18, 1960

THE WEEK'S NEWS

General Interest:

Costs Can Be Cut in Texas and Louisiana ... 41
(First of a Two-Part Study Made by the Journal)
Oil's Common Stocks Are Down—But Not Out ... 46
What the Steel Settlement Means for Oil ... 50
Gulf-Warren Consent Decree Terms Not Likely to Set Precedent ... 52
Pure Oil Reorganizes Division Offices ... 53
Grace & Co. Dickering for Control of Cosden ... 56
Crude-Price Changes Continue, Some Up, Some Down ... 57

Processing:

Four Companies Combine for New Athabasca Tar Sands Project ... 44
Strike Settlement Gives Amoco Control of Job Assignments ... 47
Transwestern Completes First U. S. Plant to Use Italian Process ... 54
Healthy Growth in Demand Predicted for Aviation Fuel ... 56
Processing Briefs ... 57

Foreign News:

1960 Will Be a Critical Year for Argentina's Oil Program ... 58
Caltex Looks Like the Big Winner in Spanish Sahara ... 61
Esso Buys Half Interest in Libyan Concessions ... 61
Pipe Shortage Forces Russia to Cut Back Pipeline Plans ... 62
Australia Has Best Show Since Flurry Created in 1953 Play ... 64

Drilling-Production:

Railroad Commission Figures Show Growing Texas Gas Production ... 43
Los Angeles Strikes Set Off Boom in Town-Lot Leasing ... 48
Wild Well in Louisiana Destroys Barge and Equipment ... 51
Texas Appeals Court Upholds Small-Tract Well ... 53

Exploration:

Canada Will Increase Oil Activity in Far North Areas ... 52
Two Lease Sales Scheduled for Alaskan Acreage ... 57
Deeper Drilling May Tap New Reserves in Eastern States ... 131
Oil Search in Australia Should Pay Off Before Long ... 134

EVERY WEEK

Advertisers' Index ... 163
Calendar of Events ... 30
Classified Advertising 159
Deaths ... 153
Drilling Contractors ... 127
Drilling Statistics ... 155
Editorial ... 39
Equipment Men ... 118
Exploration Highlights 131
Foreign News ... 58
Foreman's Page ... 97
Journally Speaking ... 37
Markets ... 158
New Equipment ... 107
On the Job—Pipelining 104
Personals ... 150
Production ... 156
Refining Statistics ... 157
Statistical Summary ... 154
Technical Questions ... 103
The Journal Said ... 37
They Say ... 26
Trade Literature ... 113
Watching Washington ... 49

Technology-Operation section on next page →

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Annual index available on request.

TECHNOLOGY—OPERATION

Refining-Processing

SPECIAL REPORT: Estimating Heat Exchangers 67

By Paul Buthod

The process engineer is often called on to make a quick estimate for a new heat exchanger, or to consider changes in an existing exchanger train. About 90% of the heat-transfer requirements necessary for such a quick estimate can be determined from this new compilation of charts and graphs. Several example problems show how these factors can be taken care of: (1) heat balance; (2) mechanical design (including tube sizes, lengths, shell diameters, and tube pitch); (3) basic heat-transfer equation; (4) film coefficients; and (5) pressure drop.

New Distillation Plant Produces Fresh Water at Low Cost 93

A new-type distillation plant, which depends on low-cost, readily available gas, uses a submerged gas burner to generate steam directly from brackish or sea water. Steam is condensed to pure water for any required use.

The Foreman's Page 97

Pressure principles aid refinery work.

Questions on Technology 103

Characterization factors and crude-oil properties.—Conductivity of stainless steels.

Drilling

9,500-ft. Holes with 5,000-ft. Rig 86

By Ed McGhee

The specialized experience of Woolf & Magee, Inc., Tyler and Shreveport drilling contractor, has made possible turnkey contracts to drill slim holes in western Mississippi and eastern Louisiana. The results: cheaper wells for both independents and majors, relatively steady work for the contractor's equipment.

Pipelining

Swampy Country and City Congestion Combated on 36-in. Line 91

By Paul Reed

The contractor had to traverse backfill on the working side of the right-of-way, work along a levee specially built through a swamp, lay pipe between poles of a power line, and blast near buildings on the Transco line near Newark.

Lube-Oil Tests Reveal Wear in Pipeline Compressor Engines 104

By D. V. Kniebes

As a result of these spectrographic analyses, it may be possible to set up recommended specifications for maximum allowable contaminant concentration in nondetergent lube oils of compressor engines. Part 2 of three parts.

Production

Wilmington Flood Operators Tackle Sand Plugging and Corrosion 98

By D. H. Stormont

Corrosion control in California's huge Wilmington water flood is achieved with inhibitors and noncorrosive materials, but sand continues to be a problem, particularly when wells must be shut in for repairs and backflow plugs the hole.

The OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Jan. 18, 1960

State oil regulations may need overhauling:

Burdensome world oversupply of oil has made many of the laws and rules hard to live with.

One major fault stands out: Regulatory systems in both Louisiana and Texas basically encourage the operator to drill some wells merely for the allowable.

In hundreds of cases the well wasn't needed to produce the oil from a reservoir and will not add to total recovery. It was just an added expense.

A Journal study shows operators also believe present policies and laws in the big oil states leave much to be desired. Changes are needed in broad areas of allocating production, well spacing, pooling properties, ratable take between fields and within fields, well and field classifications (See p. 41 for details).*

▼ ▼ ▼

Active rotary rigs in U. S. have dropped sharply to 1,673—off 180 in a week, down 108 from a month ago and 229 from the same time last year.

Sharpest decline occurred in Texas where 100 rigs became idle within the week.

Economists caution that a single week's performance is no cause for panic, that rig activity normally slows down at this season.

Probable explanations: Muddy weather in parts of Texas; tightness of certain kinds of casing, tubing, or drill pipe; low producer income; uncertainties over 1960 budgets; and tight money generally.

▼ ▼ ▼

The well-spacing fight in Greater Aneth field has been taken before the Navajo Tribal Council in a 2-day hearing at Window Rock, Ariz.

The lineup: Texaco, largest operator with 153 producers, and Humble, largest leaseholder of tribal lands in Utah with 99,000 acres, both urged 80-acre spacing be continued. Humble

---

*Refers to article in this issue giving more details. Where no page is given, the item is a Newsletter exclusive.

also asked that the area be unitized soon for secondary recovery...Shell presented its case favoring 40-acre spacing.

Same companies, plus others operating in the region, will resume hearings January 26 in Salt Lake City before Utah Conservation Commission on the issue.

The 80-acre advocates argue that 40-acre spacing would result in 400 new wells for Aneth, costing $50 million, and would add very little to recovery from the fields.

Shell, however, contends 40-acre spacing will recover 50 million barrels of primary oil which will be left behind under wider spacing.

▼ ▼ ▼

Argentina faces a critical year in 1960 on oil.

If no political troubles upset the trend, the country should continue to expand its oil industry until it becomes self-sufficient by 1964.

New policy of permitting foreigners to do development work will stand or fall this year (p. 58).

Venezuela's national oil company, a cherished dream of the present regime, may be announced April 19.

Observers report that date will coincide with festivities honoring the country's 150th anniversary of independence.

Venezuelan Government, meanwhile, has backed away from proposal to take over operation of schools, commissaries, housing, and medical facilities in oil-operating areas.

Oil companies are only too glad to have the government assume these social services. Unions, however, generally oppose and this is credited with decision to delay any action.

Settlement is not expected before end of this month—if then—in Venezuelan oil workers' union demand for increased wages and new social benefits. Companies regard them as prohibitive. President Betancourt is pressing for quick agreement.

First offshore test in Gulf of Paria by Pan Venezuelan, Indiana Standard subsidiary, is being abandoned as a dry hole. The GOPA-1 was bottomed at 6,890 ft. Second wildcat may be drilled in gulf later this year.

▼ ▼ ▼

New wildcatting looms for Alaska and the Yukon.

Two companies reportedly are dealing for rigs for use at remote locations in eastern Alaska's Yukon Flats-Kandik basin. This area is westward across the Canadian border from Western Minerals' 1959 discovery in the Canadian Yukon. The Western Minerals' well will be carried deeper this year.

Amerada is moving materials to an undisclosed wildcat spot in the Canadian Yukon. It will drill next summer as operator for a combine of U. S. and Canadian operators.

Michel Halbouty plans a second wildcat on Kenai Peninsula. Unofficial reports place it in Section 11-7n-11w as first test of new Bishop Creek unit. Location is 8 miles west of 12,037-ft. failure drilled in 1959.

Most of the potential oil basins in Australia already have been leased.

The exploration permits have been granted in large, unbroken lots. Some measuring in millions of acres.

Any lucky operator who hits oil or gas will have a production engineer's dream-setup plus a ready home market. (For a rundown on who's in Australia and where, see p. 134).

Australian exploration interest, meanwhile, centers on Victoria province where Frome-Broken Hill Co. is testing a 4,000 M.c.f. daily gas discovery, the most encouraging on the Australian mainland in several years (p. 64).

Some significant U. S. discoveries:

...In North Texas, Bayview 1 Evers 3 miles east of Denton, flowed more than 5,000 M.c.f. of gas daily from a Pennsylvanian sand. It's first gas discovery in central part of Denton County and may be a 35-mile extension of the 251,000-acre Boonsville Bend conglomerate gas field sprawling over Jack and Wise counties.

...In Michigan, Fulk 1 Zaremba in Jackson County brought in the state's first Knox oil producer. It swabbed 36 bbl. of oil on 12-hour test at 4,338-56 ft. Nearest Knox production is in Kentucky.

...In Oklahoma Panhandle, State 1 Bennett apparently has found most westerly Hunton gas producer in either Oklahoma or Kansas. Well gaged at 3,000 M.c.f. daily of gas and recovery of 360 ft. of clean oil. Test is 5½ miles northwest of Lovedale in Harper County.

▼ ▼ ▼

Big issue in gas-export hearings before Canada's National Energy Board is price domestic users have to pay in Canada.

Only token oposition has developed to the principle of gas export—this mainly from the U. S. coal lobby.

But a political storm could blow up over high prices Canadians pay for their gas and lower price for which it sells to consumers in the U. S.

The 2,500-mile LPG pipeline proposed by the Katy railroad from West Texas to Wisconsin has received the thorough scrutiny of bankers.

Their verdict on financing the project is expected this month. Early impressions generally seemed favorable.

Bids from five contractors on 720-mile Indian crude line

have been opened in London offices of Burmah Oil, two-thirds owner in the project.

Bids have been sent to the Indian Government, owner of the other one-third. Award is expected by mid-February.

Flexible steel and plastic underwater pipeline has been proposed to carry natural gas from British Columbia mianland to Vancouver Island under the Straits of Georgia.

Magna Pipeline Co., advocate of the project, says such a line would be more resistant to earthquakes than a welded steel line. The pipe would come from England.

▼ ▼ ▼

Refiners should blow the whistle on their runs.

They've been high for 3 straight weeks and last week set a new record of 8,396,000 bbl. daily. That's slightly higher than the peak reached during the Suez crisis.

Result is gasoline stocks shot up 4,982,000 bbl. for the week to total 193,948,000 bbl. That is 3.9 million barrels higher than at this time last year.

Distillate stocks were drawn down 5,648,000 bbl. but they still total 143,031,000 bbl., about 23.9 million barrels higher than last year.

Gas chromatography may become the standard method used by California natural-gasoline producers for measuring the propane, butane, and pentane content of wet field gas.

A tentative test procedure is being prepared by the California Natural Gasoline Association. It may be adopted later this year. CNGA now uses the charcoal method.

New plants: Texas Natural Gasoline has started up one of country's largest gasoline plants near Rayne, La. It can handle 700,000 M.c.f. daily of gas recovering about 350,000 gal. daily of liquid products from Columbia Gulf Transmission's Louisiana-to-Kentucky line. Plant will operate at -40° F. using hexane as an absorption medium...First computer-controlled chemical plant in U. S. is Monsanto's Luling, La., new ammonia plant. A RW-300 digital control computer only is used to monitor process conditions, make calculations, automatically adjust controls for best results.

▼ ▼ ▼

Oklahoma independents in convention last week:

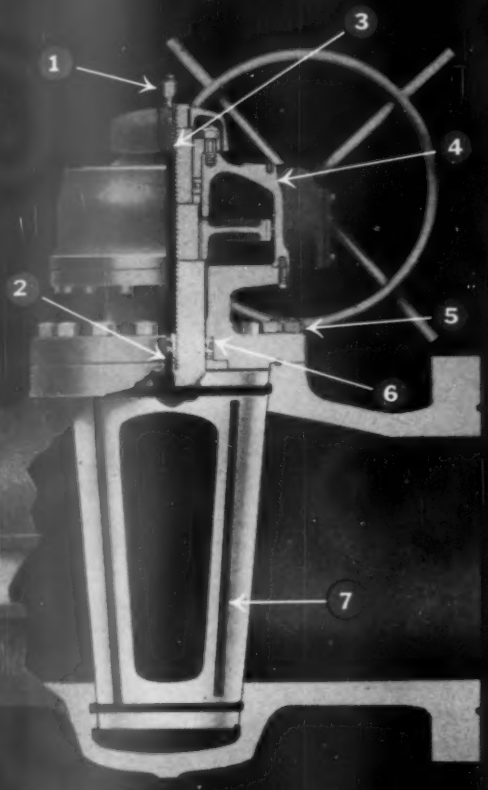
...Favored wider spacing patterns in the state.

...Asked the legislature to increase the state depletion allowance from 20 to 27½% to conform with U. S. policy.

...Opposed amending the state constitution to make mandatory a 50-bbl. daily per well minimum allowable.

...Demanded that the state corporation commission put into effect a new set of field rules written months ago.

7 characteristics that make WALWORTH a better Lubricated Plug Valve



1. Valve can be lubricated with a Walworth High Pressure Lubricant Gun without removing lubricant fitting.

2. Double ball check valve prevents line pressure from getting into lubricant system.

3. Groove, cut part way up side of lubricating fitting, provides extra safety feature by allowing operator to note any tendency of lubricant to blow out before fitting is entirely removed.

4. For buried pipelines—gear housing design permits simple attachment of lubrication and handwheel extensions without modifying the gearcase.

5. Standard bolt threads, rather than fine threads, means easy replacement of nuts and bolts from local stocks.

6. Two overlapping Teflon* packing rings form an effective seal against possible leakage without "grabbing" the plug shank. Low break-out torque—plug turns easier.

7. Vertical and circumferential lubricant grooves completely frame the port openings, assuring a tight seal against leaks.

*Du Pont registered trade-mark

Cutaway of a 24-inch Walworth Lubricated Plug Valve

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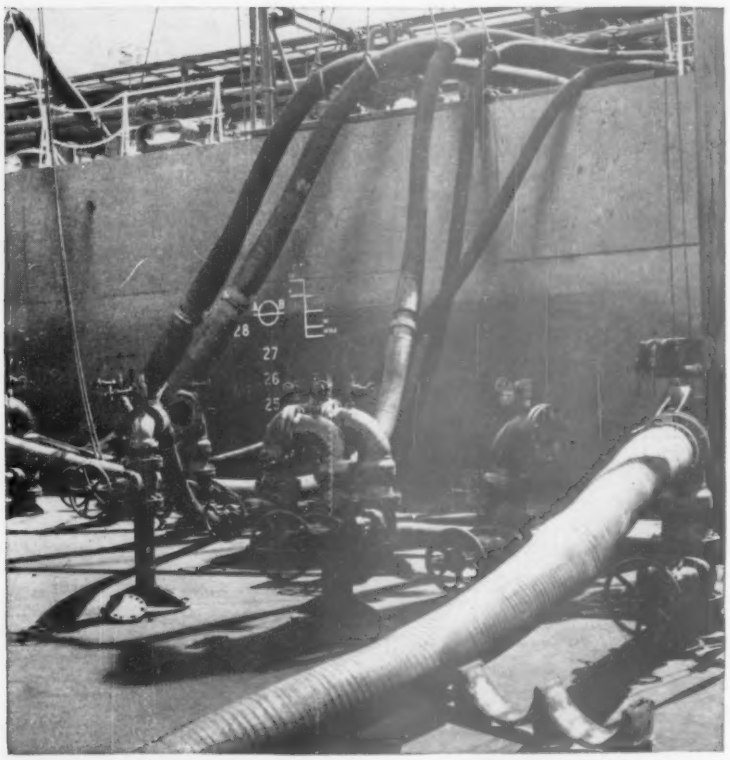

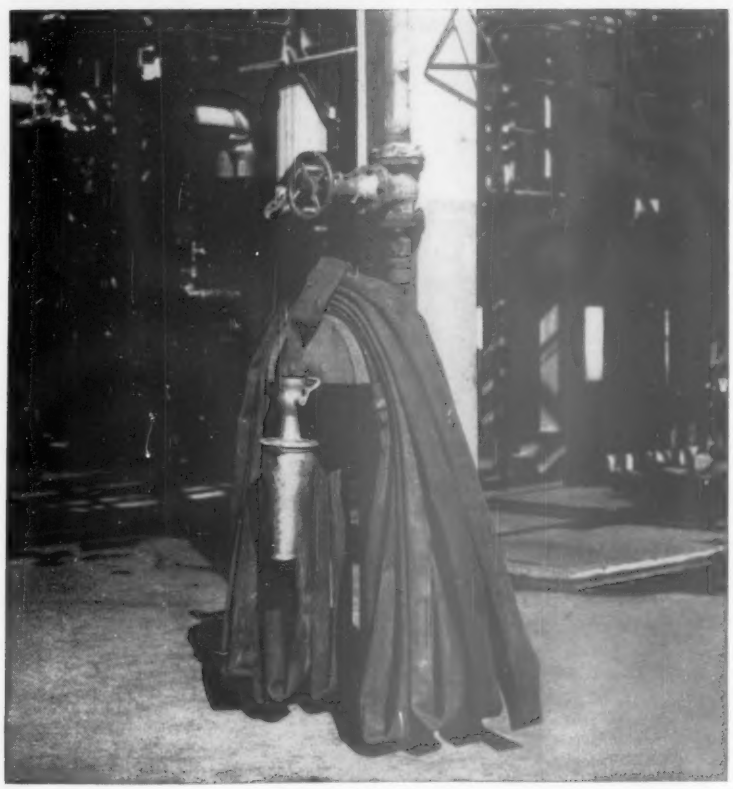

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Whether transporting products, or protecting the premises, Quaker-Thermoid hoses do the job in routine or emergencies, without risk or fear of failure.

Quaker-Thermoid Oil Suction and Discharge Hose is only one of many hoses designed especially to handle oil and its derivatives with highest efficiency and freedom from danger. Its smooth bore minimizes friction loss and increases capacity. It won't kink or crush under severest duty. Reinforced ends prevent bending or breaking at the nipple. Standard I.D. Sizes range from 3 to 12 inches. Working pressure is 250 pounds.

Petrochem Fire Hose has been specially constructed for the oil and chemical industries, and was the first all-synthetic fire hose to receive the Underwriters Laboratories Seal of Approval. Lightweight and easy to handle, it resists abrasion and is immune to oil chemicals and mildew. Available in four I.D. Sizes from 1 to 2½ inches, it has been tested under pressures up to 500 pounds.

These and other Quaker-Thermoid quality hoses and belts are as close as your nearest "Oilwell" store. Your "Oilwell" representative will gladly give you more detailed information about Quaker-Thermoid products . . . for your safety. Ask him.

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LUMMUS ENGINEERS, CONSTRUCTS NEW 31,500 BARREL PER DAY REFINERY FOR ESSO STANDARD S.A.F. AT BORDEAUX

When Lummus completed construction this spring of Esso Standard's new Bordeaux refinery, it added 31,500 barrels per calendar day to France's refining capacity. The new Bordeaux installation is also the first refinery designed and built to operate on French crude. Crude flows through a 12" pipeline from Esso-REP's Parentis field south of Bordeaux.

In recent years *existing* refineries in France have expanded greatly. The new Bordeaux refinery, on the other hand, is a "grass roots" refinery – the second built in France since World War II–and Lummus has handled the engineering and construction of both.

Although the refinery will operate at 31,500 barrels per day initially, facilities are designed to permit expansion to a 45,800 B/D throughput at minimum cost.

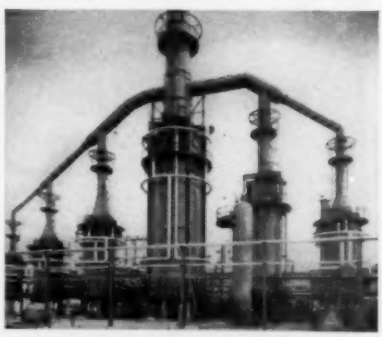
The refinery's design permits production of LPG, motor gasolines, jet fuels, kerosene, diesel fuels, heating oils, light and heavy fuel oil, and asphalts. Automatic blending equipment has been included to produce the various grades of asphalt required for the French market.

The Bordeaux refinery uses Esso Research and Engineering's "Hydro-Skimming" processing plan, which consists of atmospheric and vacuum distillation, with Hydrofining and Powerforming to produce the required gasolines. Light ends and treating sections are also included for both the pipestill and Powerformer.

In addition to product shipping facilities, Lummus also provided complete auxiliary and off-site facilities, including storage tanks, steam generation, cooling water, electric power, and air – plus the necessary piping, transfer pumping and TEL blending.

The Bordeaux project was handled by Lummus' French company, Societé Française des Techniques Lummus, with specialists from Lummus in the United States teaming up with those from Paris.

For design, engineering and construction of refineries anywhere in the world, contact one of the eight Lummus offices – and draw on more than 50 years' experience on over 800 major installations.



On the unusual heater exhaust system shown above, all vertical heaters exhaust into diagonal flues which feed one central stack.

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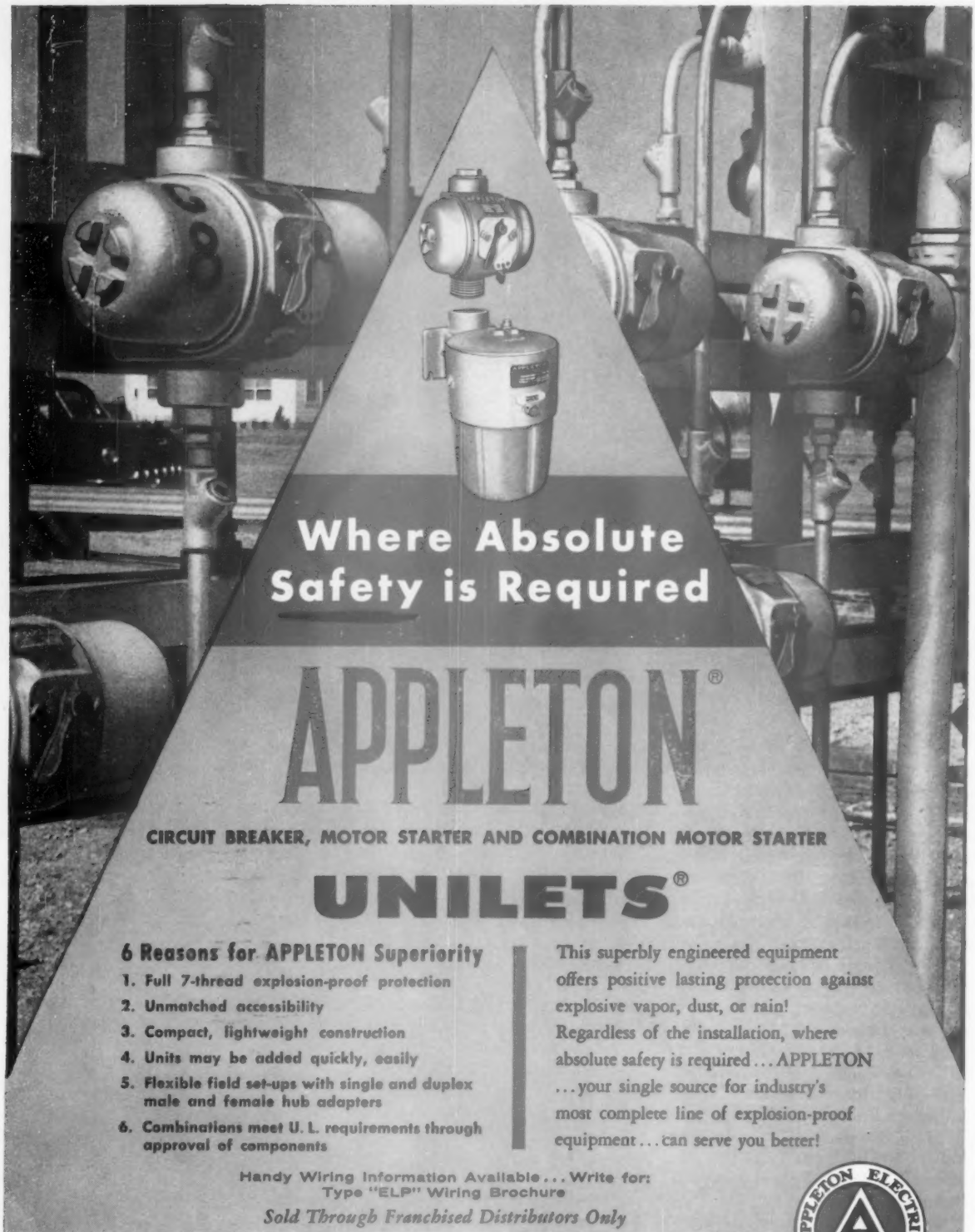

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Drilled 34 wells through Texas' toughest rock

Drilling through some of the toughest rock strata in all Texas has made short work of many a rotary hose. But the G.T.M.—Goodyear Technical Man—had no qualms when he recommended Style 3153H Hose. He knew its steel-cable-reinforced construction—factory-tested to 5,000 p.s.i.—could take on the severest oil-field service.

Yet even the G.T.M. didn't figure on the kind of punishment in store for this hose. For the operator decided to try the relatively new air-drilling technique—even though hot air, blasted through at high velocity, inevitably means shorter hose-life.

The result? At last report, the G.T.M.'s hose had drilled 34 wells—213,000 feet of hole. And a good deal of that was tough air-drilling.

But that's typical of the outstanding performance you can expect from all Goodyear hose—engineered for every phase of the oil industry. For the full story on any type, contact your G.T.M. through your Goodyear Distributor—or by writing Goodyear, Industrial Products Division, Akron 16, Ohio. • • •

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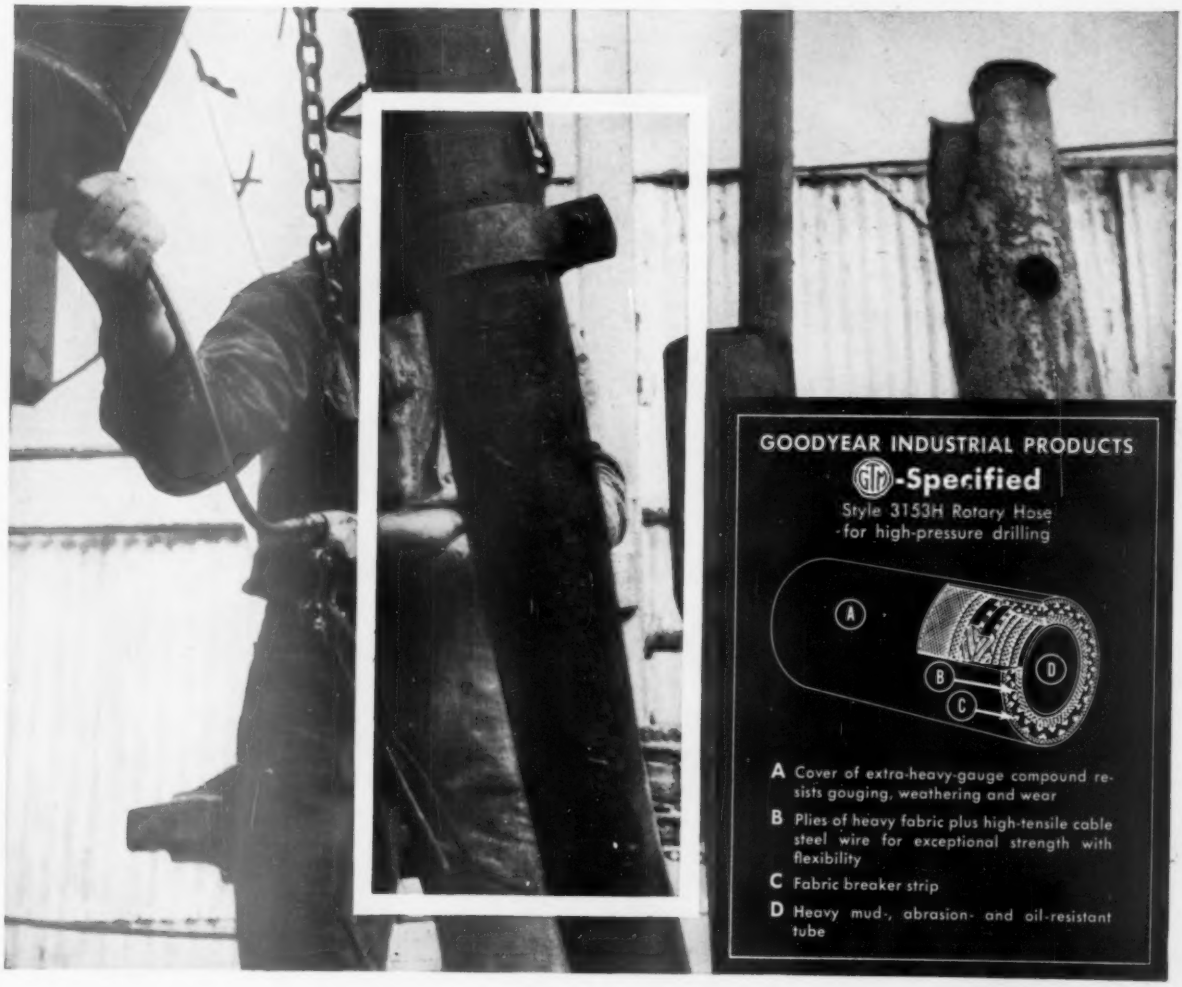
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B
C
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B Plies of heavy fabric plus high-tensile cable steel wire for exceptional strength with flexibility
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D Heavy mud-, abrasion- and oil-resistant tube

ROTARY DRILLING HOSE BY

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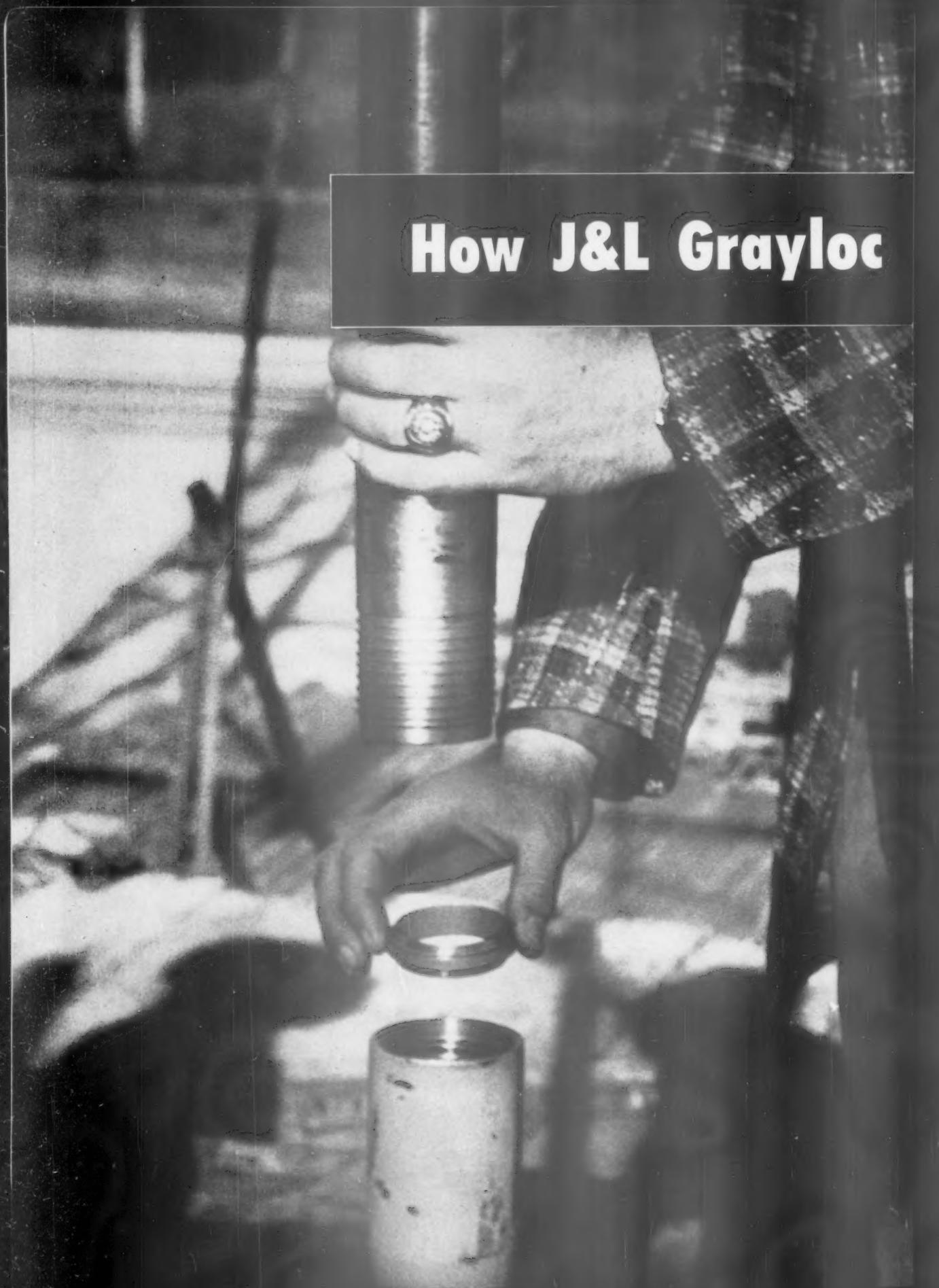

How J&L Grayloc

Ring-Seals Your Production

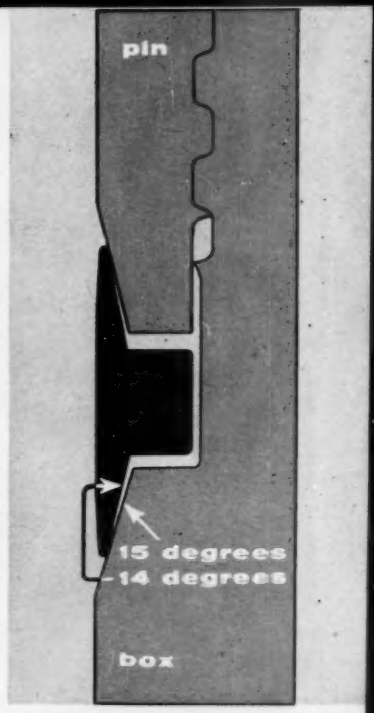
Jones & Laughlin Grayloc Tubing has a joint made leak-proof by a revolutionary seal ring. High internal pressures serve to make the seal more effective. See the drawing at right.

Note that sealing surfaces of the tubing are *inside* — not subject to damage. Modified Acme-type threads make stabbing easy, and give the connection greater strength than the body of the pipe.

The rigid segment of the steel ring transfers torque without damage, provides a positive stop in making up the joint and guards against distortion of the box.

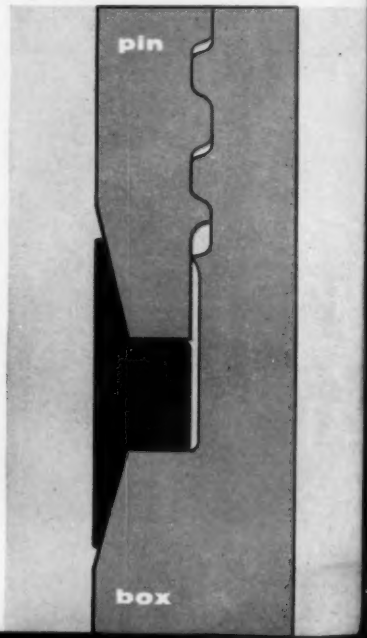
Reduced outside joint diameter makes *J&L Grayloc* ideal for dual completions.

Use *J&L Grayloc Tubing* to ring-seal your deep wells against high pressures! For immediate consideration, or for your files, call your J&L Supply man now for complete information.



Above: Line seal upon initial contact

Below: Surface seal at made-up position



Jones & Laughlin

SUPPLY DIVISION – Tulsa

If it's sold by J&L....
It's the best available

83

DRILLING EQUIPMENT: JONES & LAUGHLIN DRILL PIPE, CASING AND WIRE ROPE, GARDNER-DENVER MUD PUMPS, IDECO DRILLING RIGS, REPUBLIC ROTARY HOSE. PRODUCTION EQUIPMENT: JONES & LAUGHLIN CASING, TUBING, LINE PIPE AND WIRE ROPE, AXELSON PUMPS AND SUCKER RODS, CABOT PUMPING UNITS, CENTURY MOTORS, FAIRBANKS-MORSE ENGINES, CONTINENTAL TANKS.

(Above) This view of Platformer LPG recovery section shows deethanizer (left) and depropanizer tower (center). Third tower (right) is Unifining Unit's stripper column.

New Platforming® unit boosts production of high-octane gasoline nearly 200%

DX Sunray upgrades product quality, boosts motor fuel production capacity, with five new UOP process units

by Harry A. Brown
Vice President of Manufacturing
DX Sunray Oil Company,
Tulsa, Oklahoma

Harry A. Brown

In little more than three years after becoming the refining and marketing subsidiary of Sunray Mid-Continent Oil Co., DX Sunray Oil Co. launched a major modernization program.

In early 1959 we placed on stream at our West Tulsa refinery a 20,000 BPSD Unifining* unit, a 12,000 BPSD Platforming unit, a 2,400 BPSD Isomerization Unit and a 2,500 BPSD HF Alkylation unit. At about the same time we added at our Duncan, Oklahoma, refinery a 6,000 BPSD Unifining* unit to an existing layout which already included a 6,000 BPSD Platforming® unit, a 22,000 BPSD Fluid Catalytic Cracking unit, a 3,500 BPSD HF Alkylation unit and a 750 BPSD Catalytic Condensation unit. Installed at a cost of $12 million, and designed and engineered by Universal Oil Products Company, our new units are the most modern available and were installed to carry out our avowed objective of marketing high-quality products.

Triples high-octane output

The four UOP units provide more high-octane gasoline than the Tulsa refinery previously manufactured. The new Platformer almost triples the output of high octane gasoline there, and addition of the new HF Alkylation unit more than doubles DX Sunray's potential for producing 105-octane gasoline.

*Trademark

Being charged to the new Unifining unit is a blend of straight-run and coker naphthas for preparation as feed stock to two Platformers. These include a 7,500 BPSD reforming unit that was converted to UOP Platforming in June of 1956 and the new 12,000 BPSD unit completed this year. At relatively low cost, Unifining desulfurizes and purifies the Platforming feed stock and transforms olefins into paraffins. Combined operation with Platforming provides a most economical source for the hydrogen required in Unifining.

LPG unit recovers butane, propane

At the new Platforming unit, the Unifined, depentanized C_6-plus naphtha, or feed stock, is heated and contacted with a specially prepared platinum-containing catalyst under operating conditions to produce a C_5-plus gasoline with a leaded octane number as high as 99, if required. A rerun tower is provided for preparation of selected blending stocks. In conjunction with the Platformer there is an LPG unit designed to recover 92% butane and 60% propane.

In conjunction with the decision to modernize the Tulsa refinery, we gave careful consideration to future demands for higher-octane gasoline. Expanded facilities for alkylation, to produce motor alkylate as a blending component, were chosen since sufficient quantities of butane available in our refinery streams could be isomerized and, as isobutane, utilized as one of the feed stocks for HF Alkylation. Universal engineers, therefore, designed a 2,400 BPSD Butane Isomerization unit to service the HF Alkylation facility. The two processes are controlled and operated as a single unit.

Could produce 105-plus leaded octane

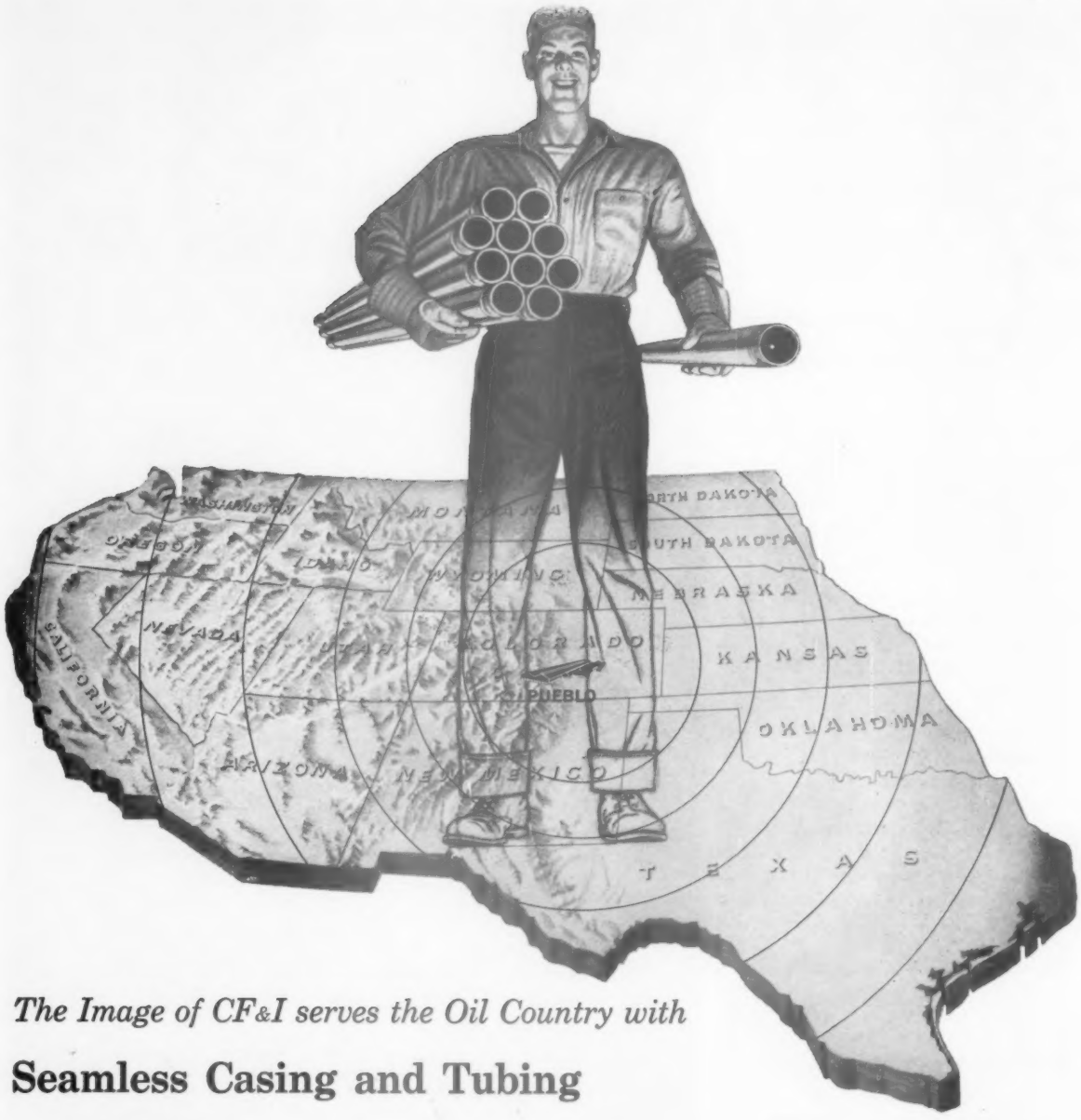
The HF Alkylation unit product is 2,500 BPSD of 105-octane gasoline blending stock. Actually, the unit would permit the Tulsa plant to turn out gasoline exceeding the 105 octane number (leaded) if market conditions should so dictate. However, DX Sunray has no immediate plans for producing motor fuels in such super ranges. If and when the need for higher-octane gasoline arises, we're ready for several years to come. Meanwhile, much of this high-octane alkylate is used to manufacture aviation gasoline. The remainder is blended with other refinery stock to produce a premium gasoline which is equal or superior in quality to any in the DX marketing area.

Combination HF Alkylation— Butane Isomerization unit assures potential production of super-octane gasoline

View of DX Sunray's isomerization unit showing three reactors at left. Second tallest tower (center) is the debutanizer column. Deisobutanizer (right) is the highest refinery tower in Oklahoma.

UOP UNIVERSAL OIL PRODUCTS COMPANY
30 Algonquin Road, Des Plaines, Illinois, U.S.A.

More Than Forty Years Of Leadership In Petroleum Refining Technology



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The CF&I giant steelman stands for dependable steel products and dependable service. Nowhere is this fact better exemplified than in CF&I Seamless Casing and Tubing. The CF&I seamless tube mill was built in the heart of the oil country—Pueblo, Colorado—to enable us to give efficient service to western oil and gas companies.

CF&I Casing and Tubing has found widespread acceptance for product dependability. CF&I's manufacturing processes—from ore to finished product—include many unique quality control procedures. This attention to detail assures casing and tubing that will stand up under the most arduous operating conditions.

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Specify Continental-Emsco D+B Duplex Subsurface Pumps

Here's the extra volume you get with D+B Duplex Pumps

Duplex Pump Size	2" x 1½" x 1"*	2" x 1½" x 1-1/16"	2½" x 2" x 1¼"	3" x 2½" x 1½"
Plunger Constant	.408	.393	.762	1.21
Equiv. Plg. Diameter	1.88"	1.84"	2.56"	3.22"
Volume Increase:				
Rod Pump	56% over 2" x 1½"	50% over 2" x 1½"	61% over 2½" x 2"	66% over 3" x 2½"
Tubing Pump	12½% over 2" x 1¼"	10% over 2" x 1¼"	27% over 2½" x 2¼"	37.4% over 3" x 2¼"

* Special middle seal

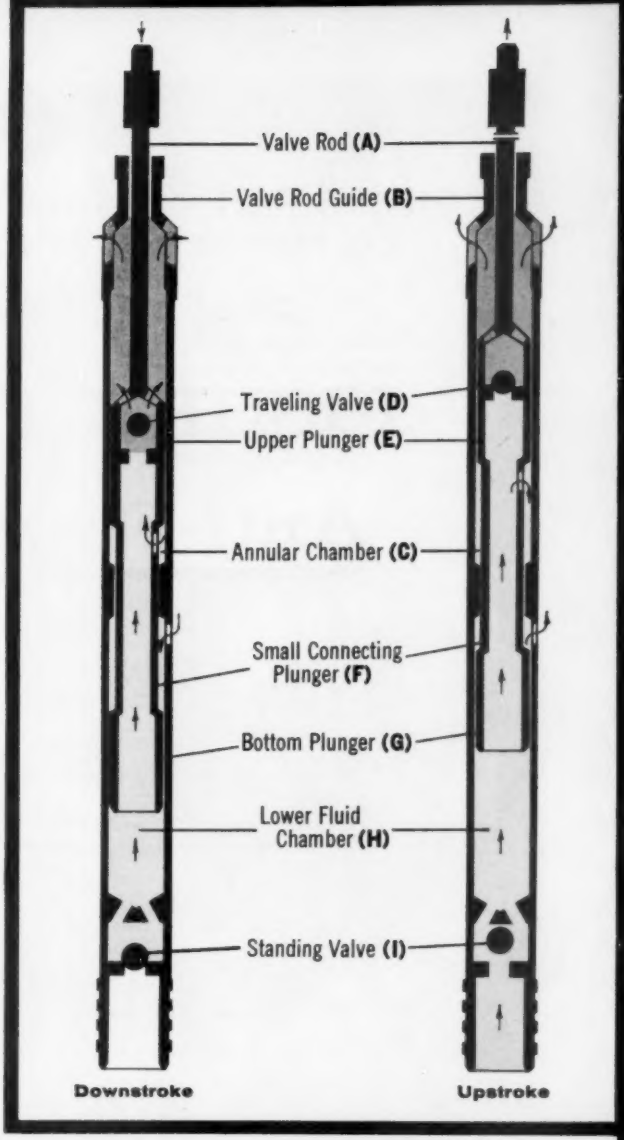
The greater volume and constant-flow design of D+B Duplex pumps give you these advantages:

CUT WELL MAINTENANCE: Greater fluid volume means: (1) slower pumping speed with less shock and wear on all equipment; (2) shorter stroke length to increase sucker rods pumping life for less wear on unit pumper's reduction gears.

INCREASED WELL EFFICIENCY: Constant fluid flow, 50% discharged on upstroke .. 50% on downstroke, reduces fluid friction through pump and keeps fluid moving up pump at all times so sand cannot settle .. prevents corrosive fluids from becoming dormant. Design reduces sucker rod buckling and provides longer plunger travel for maximum pump efficiency.

SOLVE GAS-LOCKING PROBLEMS: Traveling and standing valves can be spaced closer than on other double displacement pumps for higher pump efficiency under gaseous conditions.

ANSWERS WATERFLOODING VOLUME NEEDS: The greater volume helps to maintain tubing pump volume in waterflood areas without sacrificing the lower operational costs of a rod pump.



OPERATION: (50% of fluid is discharged on upstroke .. 50% on downstroke)

UPSTROKE: Fluid enters displacement chamber (H) through standing valve (I) and into chamber (C) between upper barrel tube and connecting plunger (F). Fluid above valve (D) is discharged into tubing through guide (B).

DOWNSTROKE: Fluid in chamber (C) is discharged into tubing through valve (D) and guide (B). Fluid fills approximately 50% of the void formed by the downtravel of upper plunger (E). Perforations to equalize pressure across lower plunger are drilled into lower pin-type collar which connects liner column to lower barrel tube.

Operators can convert existing D+B pumps into high volume Duplex pumps by using *only four* special parts. This cuts inventory costs and makes a wide choice of materials available to combat corrosion and abrasion.

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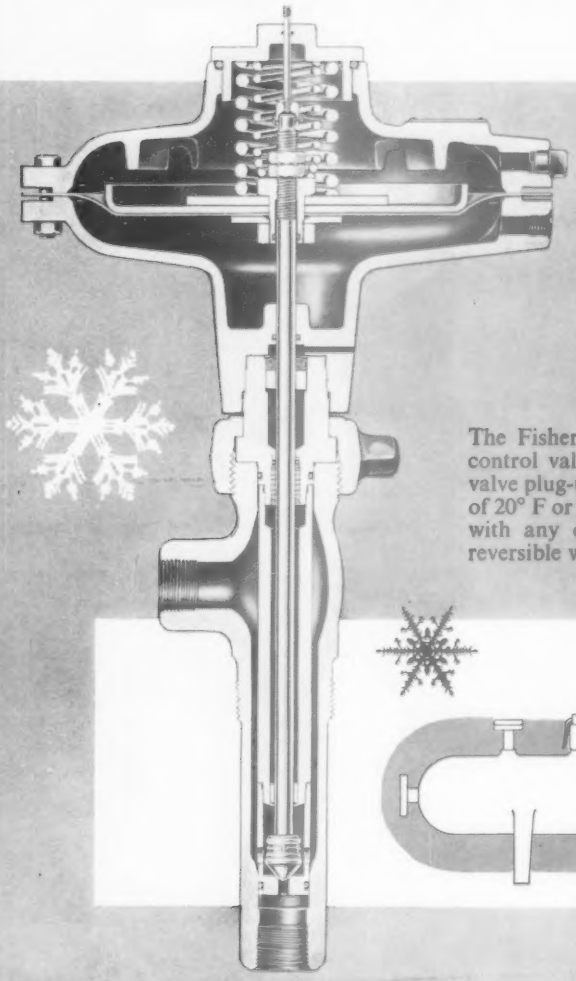
To reduce freezing hydrates and valve plug-up problems, look to the

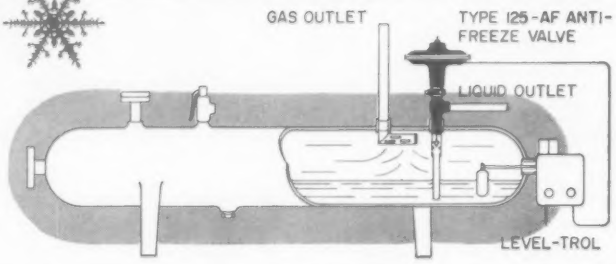
FISHER TYPE 125-AF

Anti-Freeze Oil Valve



- Longer body places orifice and inner valve deep in warmer gas phase.
- Heavy-duty cast steel body for 3000 psi working pressure; 1" angle female outlet and 2" male inlet connection.
- Inner valve and seat ring of hardened 440 stainless steel with orifice sizes of ¼", ⅜", ½" and ¾"
- Also available in Tungsten Carbide for highly erosive applications.

The Fisher Type 125-AF high pressure diaphragm control valve was developed specifically to prevent valve plug-up from freezing hydrates at temperatures of 20° F or below. The topworks can be interchanged with any other body in the series and action is reversible with no additional parts.



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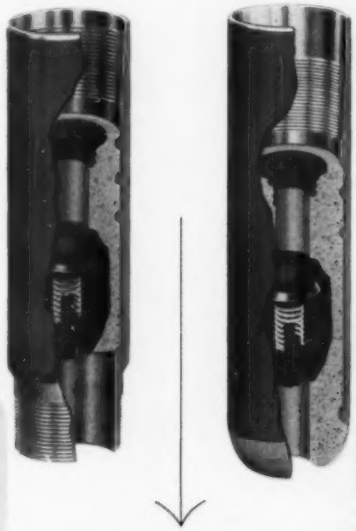
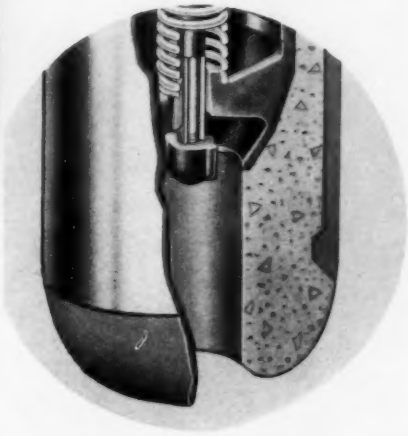
1 Halliburton's especially engineered Super Seal Float Valve Assembly combines rugged construction with large fluid flow area for maximum pumpability... high resistance to abrasion and shock load... large conical shaped valve for wide band contact with seat which provides more sealing effectiveness.



2 The concrete nose guide... with a more generous radius extending from the steel coupling... made of special formula, higher strength concrete... for greater efficiency and durability in guiding casing safely to bottom.



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Three unique features of the Halliburton Super Seal Float Collar and Float Shoe give this unequalled equipment maximum efficiency, economy and safety, even under the severe conditions of the deepest wells.

3 It's *experience*... Halliburton's experience with tools and service in more than *two million* cementing jobs... more experience by far than any company in the industry.

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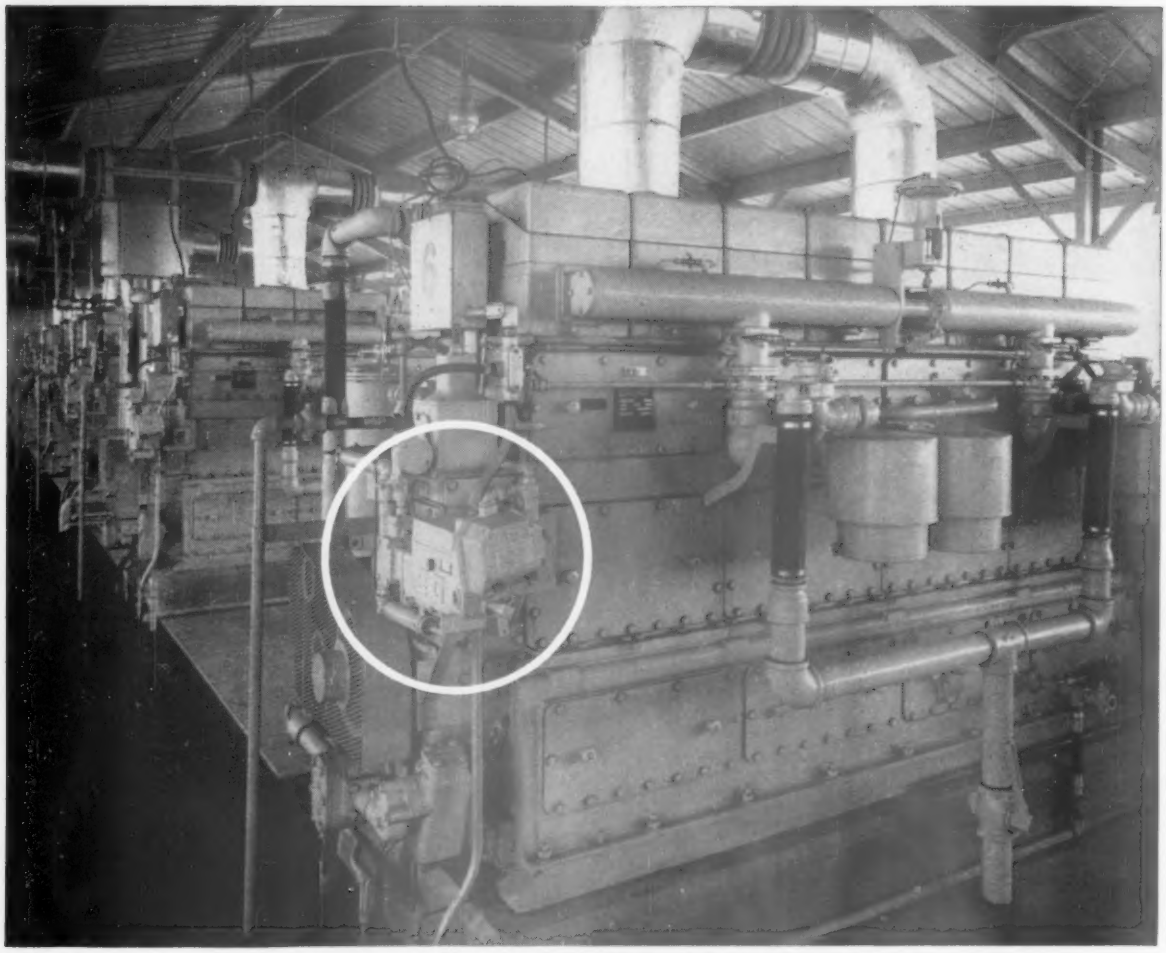


Circle indicates Bendix LC magneto on White Superior engine at Long Beach.

BENDIX LC MAGNETOS HELP POWER GIANT LONG BEACH WATER-FLOODING PLANT

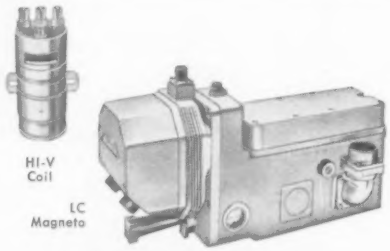
Long Beach, California, operates what may become the world's largest water-flooding plant—drawing water from the Pacific Ocean and pumping it into the Wilmington Tract beneath the city. The additional pressure created will aid in oil recovery and, it is hoped, will reduce land subsidence in the area.

Currently operating at a rate of 120,000 barrels per day, the capacity will be increased and may eventually reach 1,000,000 barrels per day—which would make it the world's largest project of its kind.

The plant is powered by eight White Superior gas engines equipped with Bendix* LC magnetos and HI-V transformer coils. These matched ignition systems, noted for long service life, simplified maintenance at low cost and complete operating reliability, can be used with engines of from six to sixteen cylinders.

If you want to know why major operators are specifying Bendix LC Ignition, write SCINTILLA DIVISION, BENDIX AVIATION CORPORATION, SIDNEY, NEW YORK.

*REG. U.S. PAT. OFF.



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THE BANK THAT GREW UP IN THE OIL FIELDS

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MONEY SAVING

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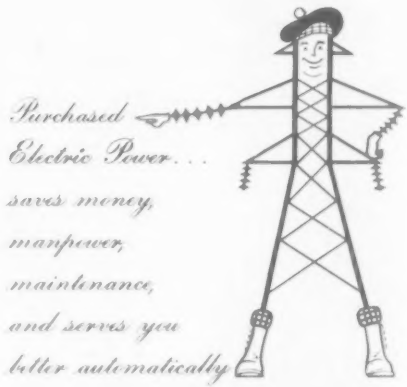

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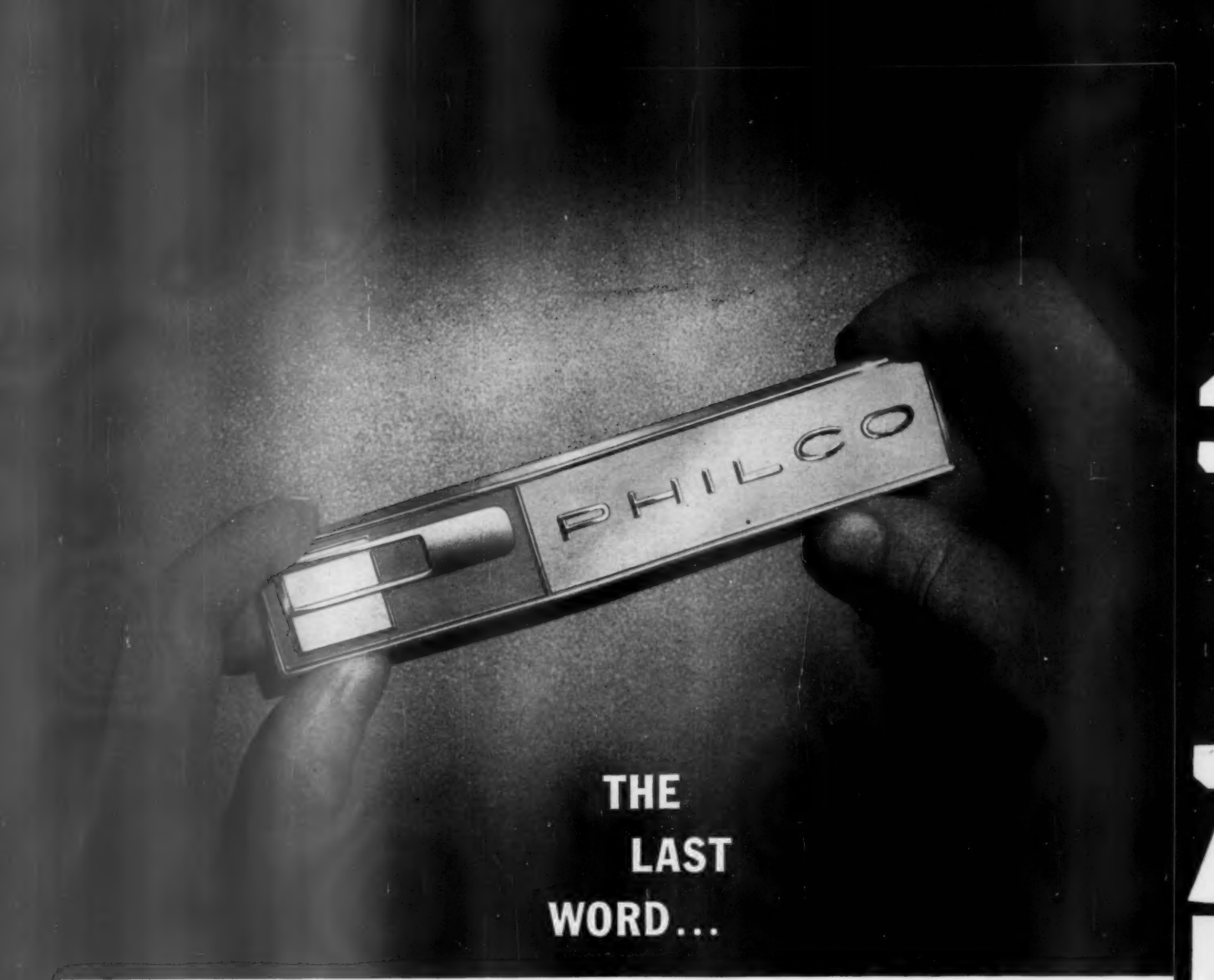

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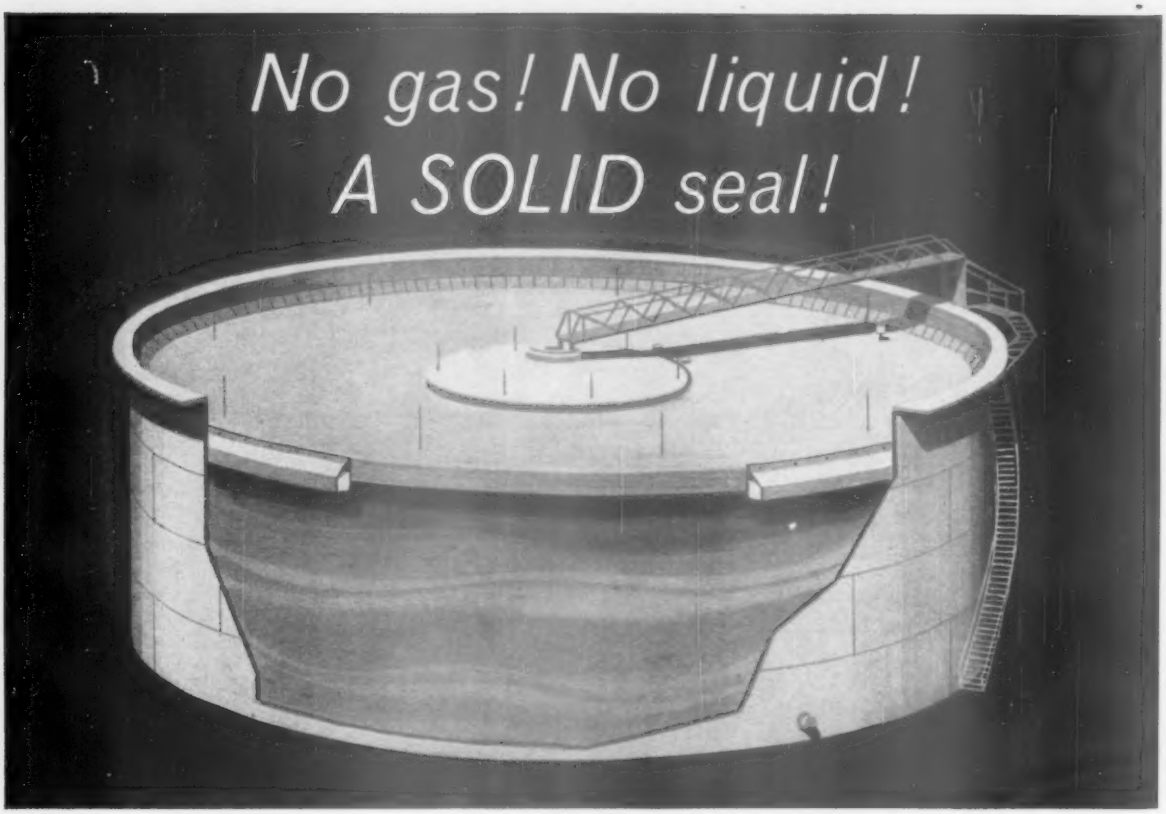

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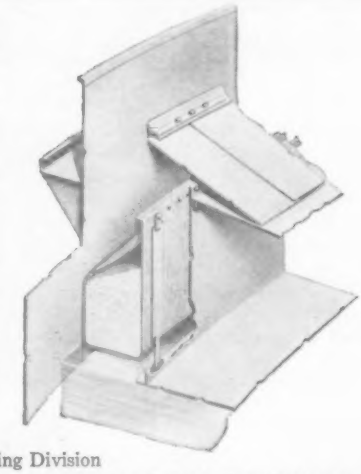

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*Patents Pending

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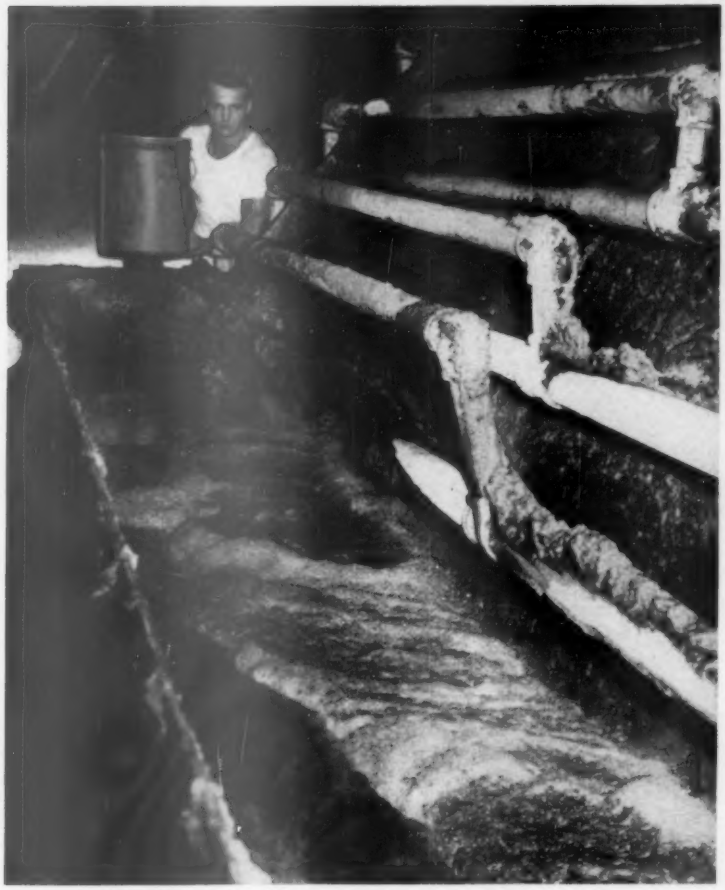

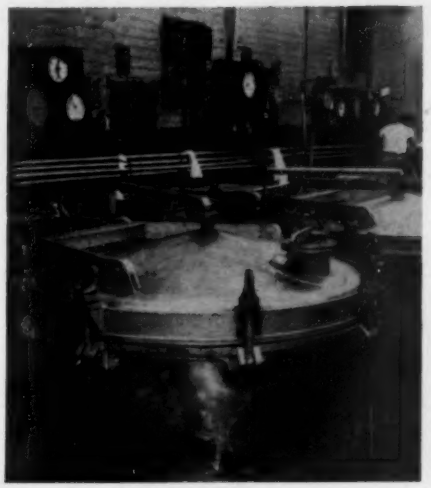

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No matter what you produce or process, you'll find Dow Corning silicone defoamers are economical; savings and production advantages are multiple. Prove this with your own tests using a generous trial sample that's yours for the asking. In writing for this free sample, please indicate your problem and mention the type of system—oil, aqueous, nonaqueous, food products, or any other. Address Dept. 2901 for a rapid reply.

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Foam may be fine in a brewery. But in most processing plants, it's a sign of inefficiency. Foam reduces production capacity, slows processing, increases waste — can skyrocket your costs way out of proportion. But why accept foam as a necessary evil when Dow Corning silicone defoamers are so readily available to knock out "bubble trouble" . . . quickly, easily and economically?

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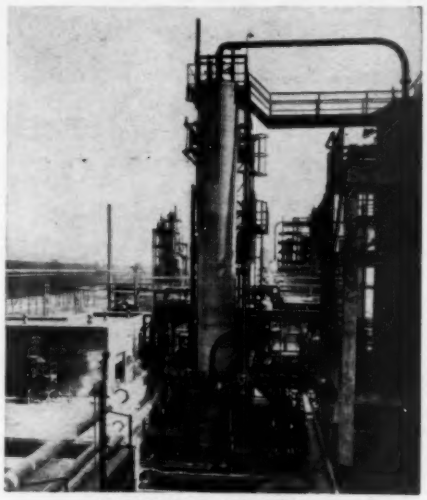

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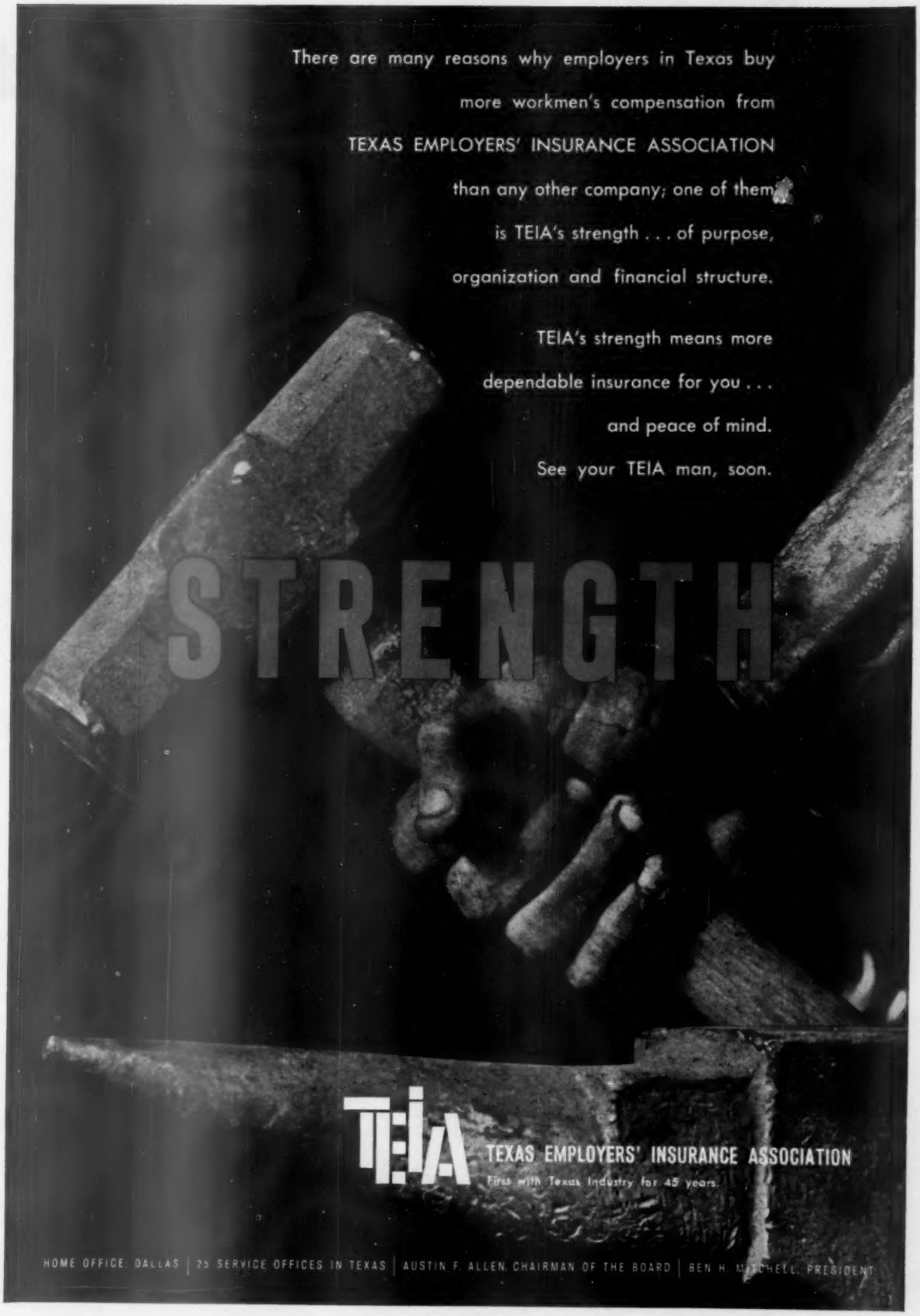
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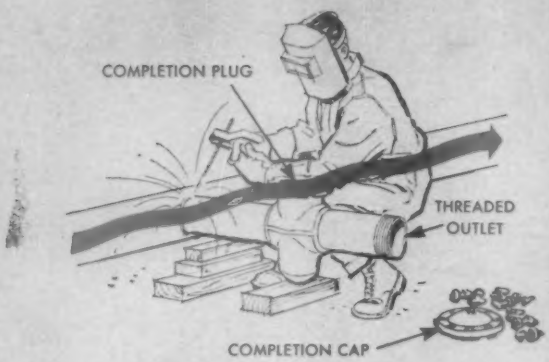
hot taps without

PROBLEM:

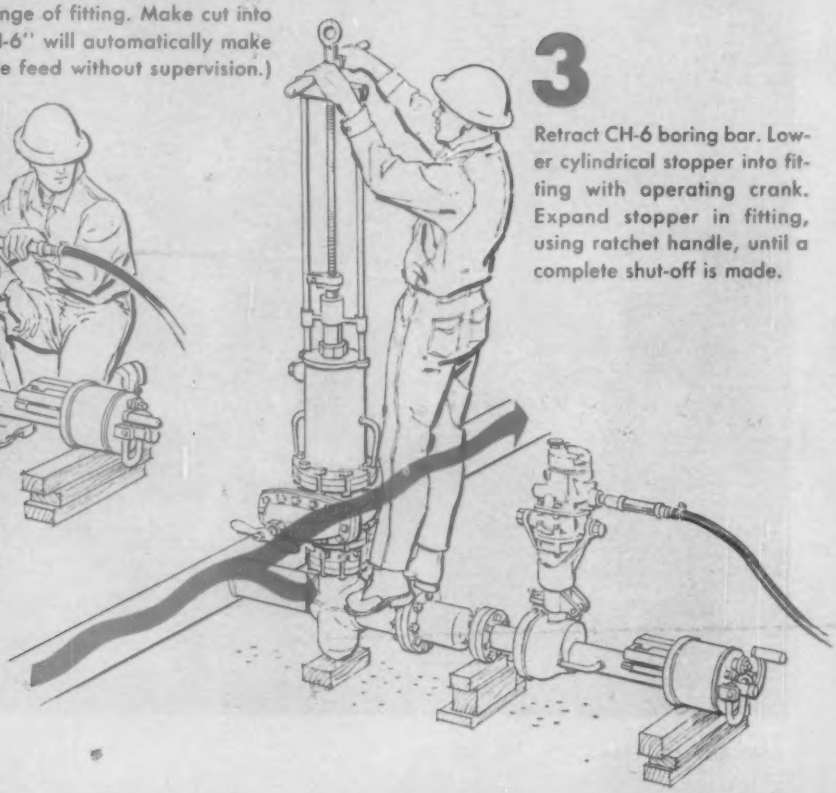
Tie in a new, permanent 6" line to present operating system without interrupting flow. Provide means of valving in new line without installing permanent valves.

HERE'S HOW



1 Weld exclusive Mueller Extension Stopper Fitting to operating line. (6" fitting shown. Other sizes from ¾" to 8" available.)

2 Attach Mueller CH-6 Drilling Machine to outlet of fitting by using companion flange. Bolt Mueller H-17340 Stopping Machine and Gate Valve to flange of fitting. Make cut into line or tank. ("CH-6" will automatically make cut and disengage feed without supervision.)



3 Retract CH-6 boring bar. Lower cylindrical stopper into fitting with operating crank. Expand stopper in fitting, using ratchet handle, until a complete shut-off is made.

valves!

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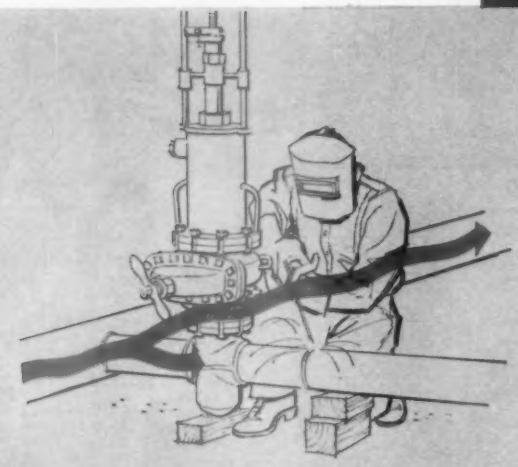
on applications of

MUELLER® NO-BLO® METHOD

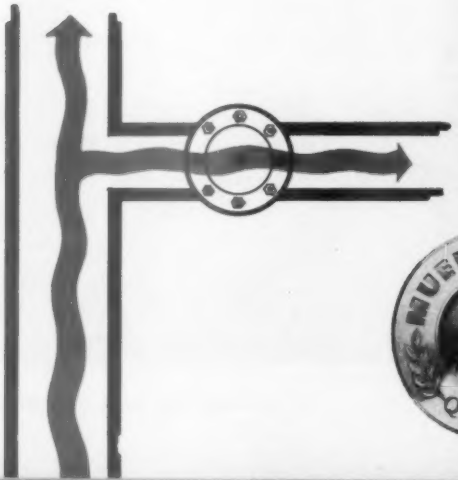


4 Remove CH-6 Machine. Attach new line to fitting and extend to next valve or complete unit. (Companion flange may be used to connect line or threads may be cut off for welding connection.)

5 Equalize pressure in new line. Contract and raise stopper. Close valve and remove stopping machine. (New piping is now under full pressure.) Bolt Mueller H-17346 Completion Machine to gate valve, open valve and screw completion plug into top of fitting. Remove machine and gate valve and bolt completion cap to flange of fitting.

SOLUTION:

Line has been safely tied in under full system pressure without shutdown or other disturbance to operating facility. Only maintenance-free fitting remains in new line—no valve! Stopping machine may be re-mounted on fitting and line stopped-off whenever needed.



These fittings and machines are just a small part of Mueller's complete system of No-Blo products—products especially designed for use with operating fluid facilities.

No-Blo products and methods make it possible to extend dead ends, to transfer service to another line, to isolate a section of line, to repair leaks, to make tie-ins, to run laterals, to install or replace equipment—all under full operating pressure in a safe, controllable manner and without shutdown!

The No-Blo System is typical of the constant attention to detail—and more than a century of experience—in research, design and engineering that is a part of all Mueller fittings and equipment.

Mueller also manufactures a full line of components for gas and water distribution systems, fire protection systems and plumbing systems.

Write for complete information and specifications.

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We've matched a transformer with a motor to cut your oil well pumping costs

You can reduce the costs of electrified oil well pumping by putting this Wagner motor and transformer oil well pumping "package" to work on your wells.

The light-weight pole-mounted service transformer is matched to its motor load—puts an adequate, dependable power supply close to the load. You can electrify leases by bringing the high voltage line to each oil well installation . . . operate each well individually. You save up to 25 percent in line materials and labor—eliminate many dead ends—reduce system losses by as much as 65 percent.

The Wagner motor is engineered specifically for oil well pumping. It has plenty of torque to handle heavy initial loads without laboring or stalling. Its high slip (carefully determined by field tests) enable it to run smoothly under cyclic loads. Class B insulation protects the motor windings, gives greater thermal capacity to absorb the heat from peak loads. It consumes fewer kilowatthours per barrel because of its efficient operation in its specific job. These motors are built in ratings of 5 hp and larger.

Your nearby Wagner field engineer will be glad to tell you about the Oil Well Pumping Motor and Transformer "Package", help you plan oil well pumping, gathering and water-flooding systems, assist you in solving your electrical problems. Call him today, or write for Bulletin EU-426A.

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Aluminum Alkyls are now available in developmental quantities and will be available in commercial quantities late this year.

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They Say—

Journal in the classroom

Dear Sir:

In the December 14 issue of the Journal, in the editorial on page 30, fourth paragraph from the end, I found some interesting advice which I reworded as follows:

"Never be on the defensive, neither apologetic, nor belligerent, intolerant, or impatient. Don't plead or demand, but make your discussion calm and straightforward."

A person who practices that advice should find himself getting ahead while others are standing still.

I continue to advertise your magazine to all students I contact who are enrolled in geology or petroleum. I'm next going to check with some of those who didn't subscribe before they graduated. Those who are already subscribers, whether in my class or others, say that the Journal is a good magazine, and that it surely keeps one up-to-date with the industry and its many problems.

The magazine performs another service also; its constant use slowly makes the student aware of the breadth of the petroleum industry. The sense of awareness is something so many students lack. It's sad that the majority of them get away from college without ever developing that sense.

William R. Higgs
Assistant Professor of Geology
Louisiana Polytechnic Institute
Ruston, La.

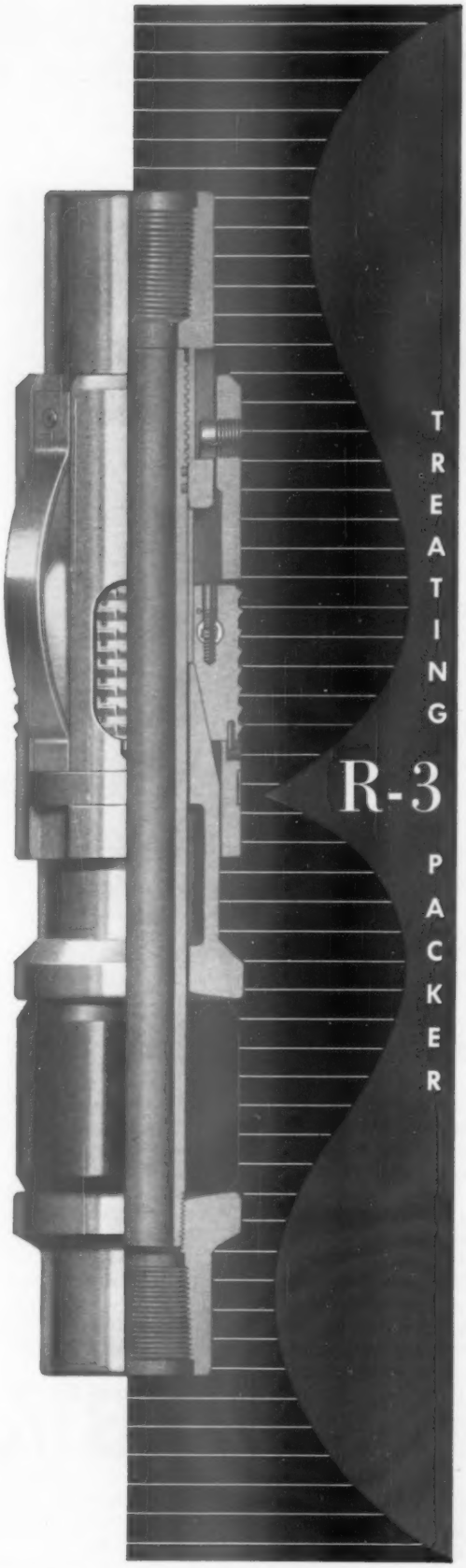
Depletion and seed corn

"Like all the other industries engaged in extracting minerals from the earth, the oil and gas producing industries are entitled under the federal income tax laws to a deduction from their taxable income to meet the depletion of their mineral assets.

"It is through this provision in the laws that our company, and other producers of oil, gas, iron ore, coal, and every other mineral, secure a significant part of the funds they need to explore for and develop new reserves.

"Minerals don't grow like wheat and oats. Yet percentage depletion might be said to provide the 'seed corn' for future 'crops' of oil, gas, and minerals.

"Should this equitable method of providing for depletion be denied to the oil industry, or should the percentage be reduced, Socony Mobil



HERE'S THE ANSWER... for shallow well packers!

The new HALLIBURTON R-3 TREATING PACKER for treating, water flooding and producing... can also be used in shallow or low-fluid wells. Short... compact... retrievable ...and dependable, for running on tubing to isolate sections... for *workover and treating* under pressures up to 5000 psi differential. Can be run as tension or compression packer.

The need for tubing hold-down... as in conventional hook wall packers... is eliminated when set in tension since the R-3 *TREATING PACKER* is self-anchoring against pressures from below. When set in compression a hydraulic tubing hold down is used. This arrangement offers the true practical operation for use of this packer at shallow depths.

- Full-opening mandrel permits passage of wire line type tools, instruments or perforating guns.
- Retrievable, may be set and reset on one trip in hole or used from well to well.
- Design makes redressing and replacement of parts a single operation.
- Safety joint allows tubing to be removed. Packer is easily drilled if conditions prevent normal removal.

Halliburton Oil Well Cementing Company now proudly adds the R-3 *TREATING PACKER* to its field-tested and proven line of superior quality packers. From the same engineering skills and years of successful experience, that has made Halliburton *foremost in oil well servicing*, comes this newest tool to fill a specific need.

Call your nearby Halliburton Representative for purchase price and full details on the "money-saving" R-3 TREATING PACKER.

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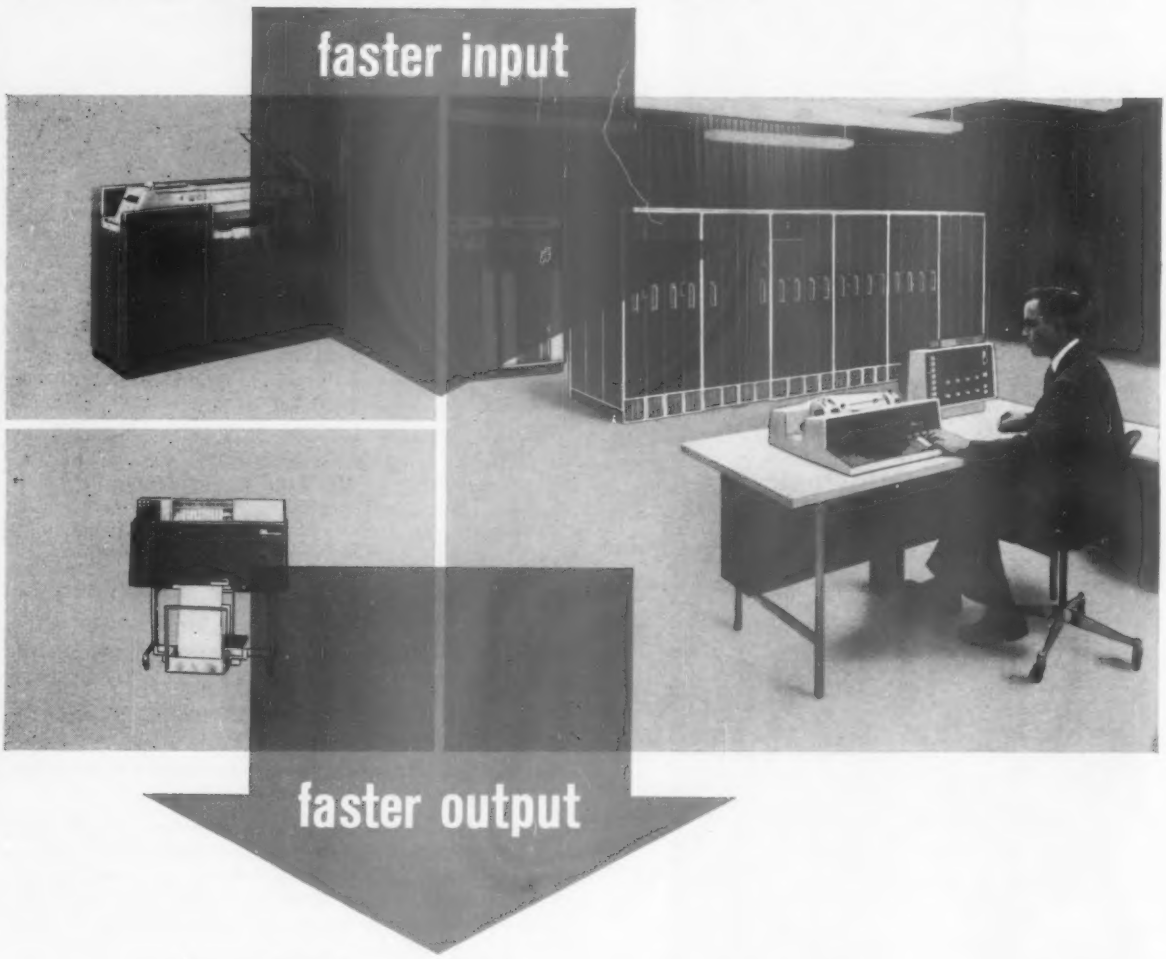
with IBM's new, high-speed 1401 System for



... the powerful IBM 7070 now packs even greater processing power

Greater flexibility in putting your problem on computer . . . greater speed in taking results off . . . greater flexibility in handling peripheral operations—these are the features that IBM's exciting new 1401 System brings to the IBM 7070. The 1401 balances input/output speeds to match the tremendous processing speed of the 7070, adds powerful off-line editing and programming facilities to free the computer for more profitable work. The total system—designated the tape-oriented IBM 7070—gives you lower job cost . . . more production per dollar.

The tape-oriented 7070 employs the 1401 System to boost card-to-tape conversion from 500 to 800 cards a minute. The 1401 also features an exclusive horizontal chain printer that turns out crisp, perfectly aligned copy at 600 lines a minute. This unique printer moves paper at magnetic tape speeds—up to three and a half times faster than conventional printers!

With these advances comes unusual flexibility. The tape-oriented IBM 7070 is a solid state, high-capacity system. It can be expanded from a single-channel 4-tape to a four-channel 40-tape system. It can read on one to four channels simultaneously with computing. And in keeping with IBM's concept of Balanced Data Processing, the 7070 is linked with comprehensive services ranging from personnel education and program planning through reliable service engineering.

For full information on the new tape-oriented 7070 call your IBM representative. Like all IBM equipment, the 7070 System may be either purchased or leased.

IBM®

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would be required to pay income taxes on what is now classed as the recovery of its capital.

"To the extent that this capital could not be recovered in higher prices, less capital would be left for reinvestment. This in turn would reduce the discovery and development of gas and oil reserves so necessary to the continued growth of the company. In other words, an attack on percentage depletion is an attack on each Socony Mobil shareholder's pocketbook."

Fred W. Bartlett, chairman, Socony Mobil Oil Co., Inc., in a letter to company shareholders.

Refinery pay check, 1914-59

"I first went on an oil-company payroll in 1914. Since that time industrial construction costs have risen 790%, the cost of living has risen 190%, the hourly wages of refinery workers have risen 1,000%, but the selling price of the oil industry's principal product—gasoline—has risen only 50%.

"In my first 15 years in the oil business I saw the hourly wages treble—and, contrary to what is commonly believed, this occurred without the aid of a national oil-workers union. In the latest 15-year period I saw them double again.

"Because prices of petroleum products have not advanced as fast as wages, refinery workers have obviously been able to buy an increasing quantity of their own product with the wages they received.

"In 1914 a refinery stillman could exchange 1 hour's work for only 2.1 gal. of gasoline. Fifteen years later his hour of work was worth 4.7 gal.; 30 years later, 11.1 gal.; and this year, 45 years later, 17.2 gal. By 1974, just 15 years away, I expect that he will be able to exchange an hour's work for 24 gal.

"Today, fringe benefits add about 25% to the value of the hourly wage."

Clarence H. Thayer, manufacturing vice president, Sun Oil Co., in a speech to American Society of Mechanical Engineers.

Jersey purposes, policies

"Apart from cutting our total spending, we are aiming our capital expenditures at new targets. Until recently our company concentrated on projects designed to assure long-term growth. Since our strength in this respect is now well established, we are able to channel a greater portion of our funds into projects that can generate more immediate profits. We expect to continue this policy through 1960.

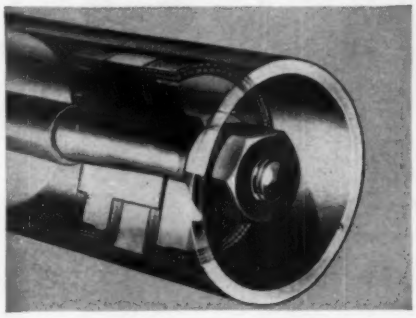
"Our company has been able to

PUMCUPS

outlast ordinary packings

3 TO 1

- *in hydraulic and pneumatic mechanisms*
- *in reciprocating pumps*



***With Darcova Pumcups**...regardless of wear, pressure keeps Pumcups hugging cylinder wall.*

Operating costs go down and efficiency goes up when Darcova Pumcups go in! Here's why:

- **Pumcups outlast other packings at least 3 to 1, based on actual reports from users**
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Available in three textures—hard, medium and soft. Also in regular or 100% nylon composition. Size ranges from ¾" to 20". For *all* the facts on Darcova Pumcups, write for Bulletin 5903.

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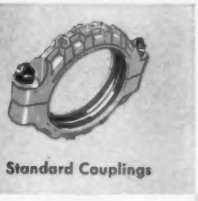
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Lightweight Couplings

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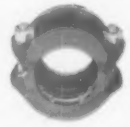

Plainlock Couplings

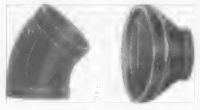
Malleable Iron Fittings

Stainless Steel Fittings

Aluminum Fittings

Plastic Fittings

PVC Lined Fittings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speed up the realization of savings made possible by heavy investments in previous years for automation and mechanization to all branches of the business. This is allowing us to handle more volume at reduced costs.

"Jersey is also making good use of its exceptional supply flexibility. A wide range of supply location puts us in a strategic position to choose the lowest cost sources of supply.

"Jersey's plan to combine its principal domestic operating affiliates into a new, virtually nationwide company, is still another move which we believe will bring benefits in the immediate future as well as for the longer term.

"Increases in efficiency brought about by automation and the other steps I have outlined are not necessarily being achieved at the price of people's jobs. The use of time-saving equipment often results in such improvements in productivity that new and better jobs are created.

"And, as far as the merger of Jersey affiliates is concerned, we view it much more as an expansion move than as an economy move. If the growth we look for takes place, it is entirely possible that we will need more, rather than fewer, employes."

Stewart P. Coleman, director, Standard Oil Co. (N. J.), in a speech to the Desk and Derrick Club of New York.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

JANUARY

18-20 Kentucky Petroleum Marketers Association, annual meeting and convention, Brown Hotel, Louisville.

22 Natural Gasoline Association of America, Gulf Coast regional meeting, Robert Driscoll Hotel, Corpus Christi, Tex.

25-28 Plant Maintenance and Engineering Show, produced by Clapp & Poliak, Inc., Convention Hall, Philadelphia.

27-28 Western Petroleum Refiners Association, Gulf Coast regional technical-industrial relations meeting, White Plaza Hotel, Corpus Christi, Tex.

31-Feb. 3 Pipe Line Contractors Association, annual meeting, Ambassador Hotel, Los Angeles.

FEBRUARY

1-4 Instrument Society of America, instrument-automation conference and exhibit, Rice Hotel and Houston Coliseum, Houston.

8 Alberta Division of Canadian Petroleum Association, annual meeting. Hotel Palliser, Calgary.

7-10 American Association of Petroleum Geologists, Rocky Mountain section annual meeting, Billings, Mont.

14-18 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Statler-Hilton and McAlpin hotels, New York.

21-24 American Institute of Chemical En-

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- TANK CLEANING
- MUD MOVING
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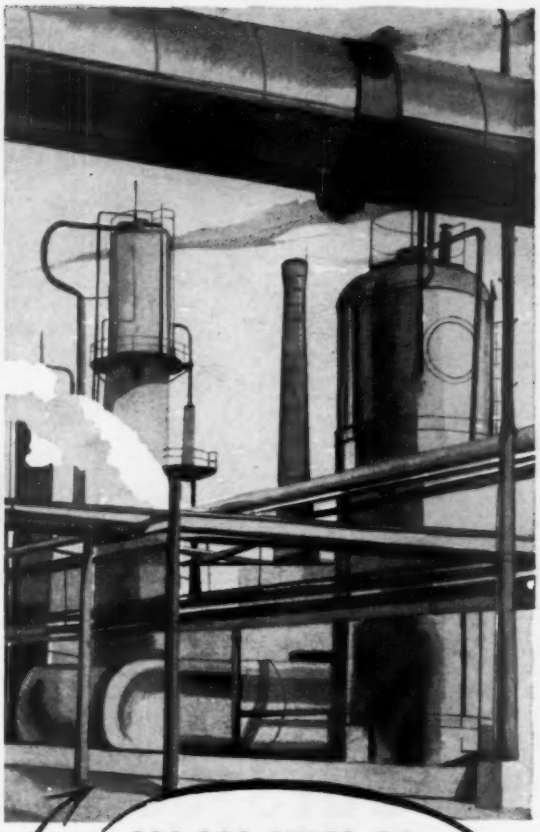
ROBERT F. CASHEN, Assistant Vice President
Manager, Petroleum Department



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Kansas Paint & Color has been providing the petroleum industry with protective and corrosive inhibitive finishes for 42 years.

It would be difficult to accurately estimate the amount of paint that has been produced specifically for the Oil and Gas Industry by Kansas Paint & Color in their 42 years of paint manufacturing. The point we want to make is that in the heart of the American Oil Industry there is a manufacturer who has grown with the industry by serving the industry.

Whatever your paint needs may be, at Kansas Paint & Color, there's a Red Brush* product designed, compounded, and field-tested to do the job better.

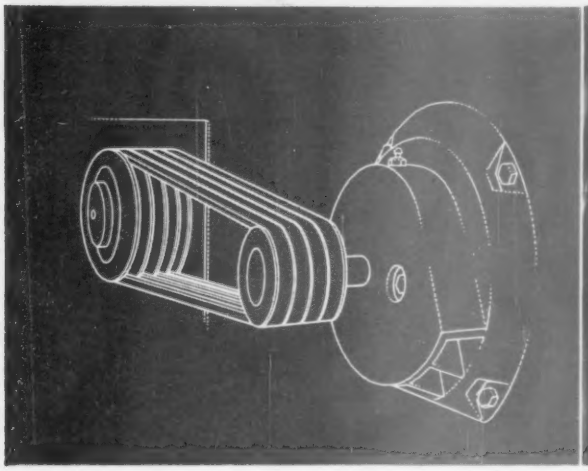
If you have a paint problem, Red Brush* has the answer. Address your inquiries to:

KANSAS PAINT & COLOR CO.
133 North Mosley • Wichita, Kansas

*Red Brush is the Kansas Paint & Color Trademark

BEFORE: This drawing of the former 4-belt drive on a clothes pressing unit is in the same scale as the photo of new Super HC V-Belt Drive at right. Heavy sheaves needed for 4 belts imposed high bearing loads.

AFTER: By redesigning the drive for Gates Super HC V-Belts only 3 belts are required and this Utah manufacturer saves 16 pounds in weight and 24% on the drive cost of every pressing unit it makes.



Manufacturer of pressing equipment cuts cost of drives 24%

New high capacity V-belt also saves weight and space!

This manufacturer is just one of many who have already turned to Gates Super HC V-Belts to achieve far more compact, lighter weight, lower cost V-belt drives for all types of machines. With new Super HC V-Belts, sheave dimensions can be reduced 30% to 50%, overall space up to 50%, and drive weight by 20% and more.

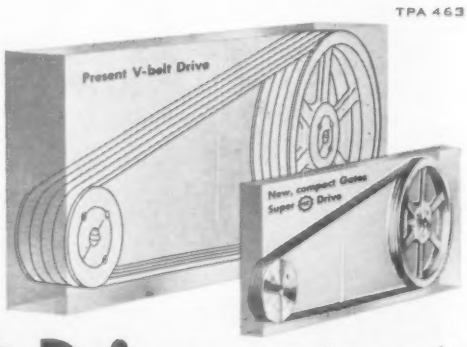
A product of Specialized Research in the world's largest V-belt laboratories at Gates, the Super HC V-Belt Drive is already standard equipment on production models in virtually every industry.

Engineering Service Nation-Wide

Whatever your plant's power transmission design problem, wherever you are, your nearby Gates Distributor or Field Representative is ready to assist you to cut space, weight, and costs with Super HC. Ask him for a copy of *"The Modern Way to Design Multiple V-Belt Drives."*

TPA 463

The Gates Rubber Company, Denver, Colorado
Gates Rubber of Canada Ltd., Brantford, Ontario



Gates *World's Largest Maker of V-Belts*

Gates Super HC V-Belt Drives same hp capacity in smaller "package"

gineers, meeting, Biltmore Hotel, Atlanta.

24-25 Wisconsin Petroleum Association, annual convention and exhibit, Schroeder Hotel, Milwaukee.

24-26 National Association of Corrosion Engineers, Tulsa section, eleventh annual corrosion short course, Mayo Hotel, Tulsa.

26 Natural Gasoline Association of America, Permian Basin regional meeting, Lincoln Hotel, Odessa, Tex.

26 Ohio Oil and Gas Association, winter meeting, Deshler-Hilton Hotel, Columbus, Ohio.

MARCH

1-4 American Petroleum Institute, Division of Production, southwestern district meeting, Statler-Hilton Hotel, Dallas.

3-4 American Gas Association, Pacific Coast Gas Association, joint public relations conference, Biltmore Hotel, Santa Barbara, Calif.

6-9 American Society of Mechanical Engineers, gas turbine power and hydraulic conference, Rice Hotel, Houston.

7 Canadian Petroleum Association, annual general meeting, Hotel Palliser, Calgary.

7-8 University of Florida, annual heat transfer symposium, Engineering and Industries Building, Gainesville, Fla.

14-18 National Association of Corrosion Engineers, sixteenth annual meeting, Memorial Auditorium, Dallas.

16 Petroleum Equipment Suppliers Association, eastern district membership meeting, Duquesne Club, Pittsburgh.

16-18 American Petroleum Institute, Division of Production, southern district meeting, Hilton Hotel, San Antonio.

18 Natural Gasoline Association of America, Oklahoma regional meeting, Biltmore Hotel, Oklahoma City.

21-23 Midwest Gas Association, annual meeting, Hotel St. Paul, St. Paul.

22 Petroleum Equipment Suppliers Association, Gulf Coast district membership meeting, Shamrock Hilton Hotel, Houston.

24-25 New England Gas Association, annual meeting, Hotel Statler-Hilton, Boston.

28-30 Western Petroleum Refiners Association forty-eighth annual meeting, Hilton Hotel, San Antonio, Tex.

29-31 American Power Conference, annual meeting, Sherman Hotel, Chicago.

30-Apr. 1 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Broadview Hotel, Wichita.

APRIL

3-8 Engineers Joint Council, sixth nuclear congress, New York.

4-7 Oil Heat Institute of America, annual convention, Park-Sheraton Hotel, New York.

4-7 National oil heat and air-conditioning exposition, Coliseum, New York.

5 Petroleum Equipment Suppliers Association, southern mid-continent district membership meeting, Statler Hilton Hotel, Dallas.

5-7 Instrument Society of America, national chemical and petroleum instrumentation symposium, Rochester, N. Y.

7-8 Rocky Mountain Oil and Gas Association, midyear meeting, Newhouse Hotel, Salt Lake City.

12-14 Petroleum Industry Electrical Association, Petroleum Electric Supply Association, conference and exhibi-

MASTER MECHANICS CORNER:

Russ Hill, Master Mechanic in charge of 67 machines for Holloway Construction Co., building 27 miles of highway . . . Albion to Battle Creek, Michigan

"Only Cat Dealers offer so many services . . . parts assembly exchanges, rebuilding, shop and field repairs and immediate availability of almost all parts."

Caterpillar Tractor Co., General Offices, Peoria, Ill., U. S. A.

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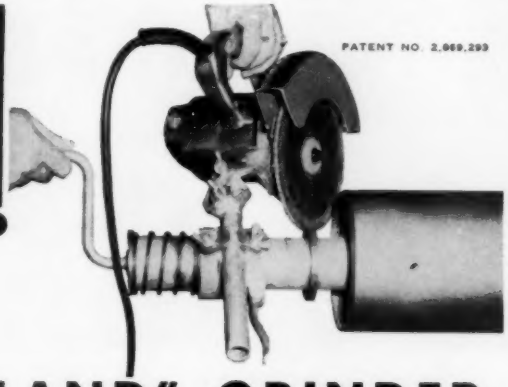

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"BEVEL-LAND" GRINDER

automatically cleans and lands pipe bevels

The new H & M "BEVEL-LAND" GRINDER employs an electric grinder to automatically clean and smooth pipe cuts and put the land on bevels. The machine may be placed on the pipe and in operation in less than one minute. A simple adjustment in angle of the grinding wheel is all that is required to change the machine from the cleaning to the land position. The H & M "BEVEL-LAND" GRINDER assures more postive alignment of pipe and better quality welds. The machine is available in two models: one for 6" to 14" and one for 14" to 36" pipe.

WRITE FOR YOUR COPY OF A CATALOG SHEET WHICH DESCRIBES ALL THE FEATURES OF THE NEW H & M "BEVEL-LAND" GRINDER.

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PIPE BEVELING MACHINE COMPANY

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TULSA, OKLAHOMA

Photographed at Standard Oil of Ohio, (Toledo Refinery)

The constant challenge and the continuous answer

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Cooperation with refiners helped Cyanamid develop an answer in Aerocat® micro-spheroidal synthetic catalyst. Aerocat provides high activity, stability, and selectivity through controlled physical properties. You can depend on Aerocat for efficient overall performance and satisfactory product realization.

The Cyanamid sales representative—the Man with the Golden Rule—played an important role in developing Aerocat and other catalysts. His job is not simply to sell. His job is to help you in your continuous task to meet the constant challenge. Behind his knowhow are the resources of a major catalyst producer that is also a major manufacturer of other chemicals—Cyanamid. Call when you need the aid of his skill.

Basic in catalyst chemistry

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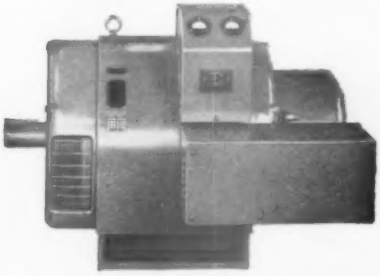
A COMPLETELY NEW "PACKAGED" GENERATOR

AMP-PAK



AMP-PAK Generator shown is rated at 187 kva, 1200 rpm, 240/480 volts. AMP-PAK is available in ratings of 75 thru 187 kva at 1800 rpm and 62½ thru 187 kva at 1200 rpm. Three phase, 80% PF, 60 cycles, 50C rise, and 120/208, 240 and 480 volts.

No exciter... No moving parts in the voltage regulator

AMP-PAK is a compact, revolving field a-c generator with built-in, static excitation system; static voltage regulator; and basic metering and controls conveniently grouped. AMP-PAK is a portable unit, factory assembled, internally connected, and tested.

No rotating exciter to maintain. D-C excitation is provided by a heavy duty, long-life, static rectifier.

No tubes, relays, vibrators to service. Voltage is regulated by a static, E-M-developed sensing circuit and "magical" magnetic amplifiers.

Holds voltage "rock-steady" so your motors, lights, and electronic equipment will work better. The static regulator provides ±2% regulation.

Starts big motors. A special, built-in voltage booster transformer stands by to reinforce line voltage when heavy loads are suddenly applied.

Easy to install. Needs no switchboard. Just connect load to AMP-PAK thru a suitable line switch.

Simple to operate. Has no belts, no "tricky" commutator, no adjustments—anyone can operate AMP-PAK.

See your nearest E-M Sales Engineer and write the factory for publication PRD-236.

E-M

ELECTRIC MACHINERY MFG. COMPANY
Minneapolis 13, Minnesota

Largest manufacturer of "Packaged" Generators

2100-TPA-2154

tion, Municipal Auditorium, Kansas City.

19-21 University of Oklahoma, College of Engineering, southwestern gas measurement short course, north campus, University of Oklahoma, Norman.

20-22 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Gladstone, Henning, and Townsend hotels, Casper, Wyo.

20-22 National Petroleum Association, semiannual meeting, Hotel Cleveland, Cleveland.

21-22 Texas Technological College, seventh annual West Texas oil lifting short course, Lubbock, Tex.

21-23 Society of Economic Paleontologists and Mineralogists, Permian basin section annual meeting and field trip, Abilene, Tex.

24-26 Independent Petroleum Association of America, midyear meeting, Denver Hilton Hotel, Denver.

25-26 American Society of Mechanical Engineers, maintenance and plant engineering conference, Chase-Park Plaza Hotel, St. Louis.

25-27 Southern Gas Association, convention, Buccaneer and Galvez hotels, Galveston.

25-28 American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

25-29 American Welding Society, annual meeting and welding exposition, Los Angeles.

26 Petroleum Equipment Suppliers Association, Pacific district annual membership meeting, Ambassador Hotel, Los Angeles.

27-29 Natural Gasoline Association of America, annual convention, Rice Hotel, Houston.

28-29 American Petroleum Institute, Division of Transportation, pipeline conference, Mayo Hotel, Tulsa.

28-29 Pacific Coast Gas Association, distribution conference, Benson Hotel, Portland.

MAY

1-4 American Petroleum Institute, Division of Transportation, tanker conference, Seaview Country Club, Absecon, N. J.

2-3 Society of Petroleum Engineers of AIME, North Texas section, fourth biennial secondary recovery symposium, Wichita Falls, Tex.

5-6 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual joint meeting of Rocky Mountain petroleum sections, Calgary.

5-6 Canadian Institute of Mining and Metallurgy, annual technical meeting of petroleum and natural gas division, Palliser Hotel, Calgary.

9-12 American Petroleum Institute, Division of Refining, midyear meeting, Statler and Sheraton-Cadillac hotels, Detroit.

9-12 Instrument Society of America, instrument-automation conference and exhibit, Civic Auditorium and Brooks Hall, San Francisco.

9-13 American Gas Association, distribution and transmission meeting, Jung and Roosevelt hotels, New Orleans.

12-13 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.

12-14 Kansas Independent Oil and Gas Association, annual meeting, Lassen Hotel, Wichita.

STUCK PIPE?

MUDBAN

Mudban*, Dowell's low-cost mud-dispersing agent, is designed to make quick work of loosening stuck drill pipe. Mudban is used to remove filter cake from formation face. Also used effectively in well clean-out work. A little goes a long way. Be ready. Keep a can of Mudban on hand. Available from all 150 Dowell offices and stations.

*Dowell Trademark

Products for the oil industry

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

DIAL DOWELL

B&W has taken the step...

a NEW PLANT at Beaver Falls for the manufacture of a

COMPLETE LINE OF WELDING FITTINGS AND FLANGES

Beaver Falls, Pennsylvania is the site for B&W's new Welding Fittings plant. When in operation it will be one of the most efficient sources of supply in the industry... one that has been designed with product quality as well as customer service in mind. Not only will it have facilities for the manufacture of a complete line of carbon, alloy and stainless steel fittings and flanges, but its location makes possible integration with B&W's other manufacturing operations... their steel mills and their tube mills.

This means that

(a) you can get a complete line of welding fittings and flanges

(b) you can get a complete process piping package — welding fittings, flanges *and* tubular products from one source

(c) you can more effectively control both buying and delivery from one manufacturer... The Babcock & Wilcox Company

An announcement of the transfer of welding fittings operations from Milwaukee to Beaver Falls will be made in the near future.

For further details ask for bulletin FDM-2016 or call on any of the local B&W District Sales Offices. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.

B&W

THE BABCOCK & WILCOX COMPANY

TUBULAR PRODUCTS DIVISION

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Seamless and welded tubular products, solid extrusions, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels and special metals

the Journal said...

50 years ago

January 20, 1910

The Texas Co. breaks ground for new refinery on recently purchased 120-acre tract adjoining its Clinton tank farm just across the Arkansas River from Tulsa. Initial capacity to be 7,000 bbl. daily. Plans also revealed for another new refinery to be built on newly acquired site on Red River near Shreveport.

New rotary drilling bit designed by Arthur Knapp, of Houma, La., uses manganese steel for cutting faces and special method of socketing without threads. Designer claims it will last three to four times longer than ordinary steel bits.

Lone Star Co.'s notoriously wild gas well at Petrolia, Tex., closed in after 58-day rampage. Flow during spree estimated at 40,000 M.c.f. daily.

25 years ago

January 17, 1935

Socony-Vacuum Oil Co., Inc., consolidates operations of three refining and marketing subsidiaries under single name of parent company. Involved are White Eagle Oil Co., Augusta, Kans.; White Star Refining Co., Detroit; and Lubrite Refining Corp., St. Louis.

New well drilled by Humble Oil & Refining Co. at Roanoke, in Jefferson Davis Parish, Louisiana, becomes deepest production on Gulf Coast. Deep extension well, 3 DeVilbiss, flows estimated 3,000 M.c.f. of gas daily through 5/16-in. choke from 9,425-ft. depth.

American Tank Storage & Terminal Co. starts construction of new tank farm and oil terminal east of Houston on thriving Houston Ship Channel. Storage capacity of 500,000 bbl. to be provided initially. Corpus Christi and New York terminals being expanded.

10 years ago

January 19, 1950

Active drilling-development program in spreading Elk City field in Beckham County, western Oklahoma, enlivened by spectacular blowout and fire in Shell Oil Co. deep, high-pressure well. Blaze destroys Helmerich & Payne rotary rig valued at more than $450,000. Uncontrolled flow estimated at 40,000 M.c.f. of gas and 300 to 400 bbl. of condensate daily from depth of 9,725 ft.

The Texas Co. moved out of Michigan second time in 15 years. Land and geological offices closed after 5-year tenure.

Creole Petroleum Co.'s new Amuay Bay refinery in northwestern Venezuela goes on stream with daily crude-oil run nearly 63,000 bbl. Plant to cost eventually $150,000,000 is major addition in refining program destined to make Venezuela world's fifth-largest refining country.

JOURNALLY SPEAKING

You Run Too

WE'RE ABOUT 3 months behind on our reading, so only yesterday we came across an anecdote about oil men in an old Reader's Digest.

It seems that a couple of men, cramped after a long automobile ride, decided to stretch their legs by running an impromptu footrace close to where a drilling rig was operating.

In a few minutes they discovered that the driller and his whole crew were running after them as fast as they could. The men stopped and asked what was the idea.

"When you're in the oil business, Mister," the driller explained, "if you see somebody running you run too and ask questions later."

That struck us as a pretty good commentary on the oil business—you run too and ask questions later.

Certainly it's true of the drilling end of the business. When word gets out that some presumably smart operator is leasing in some area, everybody else rushes in to sew up leases in the vicinity. They figure the first man must have some good reason and they'll find it out later.

An example that springs to mind is North Dakota. Within weeks after the discovery well was brought in, Bismarck and Williston were jammed with oil operators and the lease play had spread hundreds of miles from the Nesson anticline. It was much later that some of these operators began to ask questions about the probabilities of finding oil in other parts of the state and the prospects for marketing it if they found it.

The drilling splurge in Spraberry is another case of running first and asking questions later. After a lot of people lost their shirts on close-spaced wells in what came to be known as the world's greatest reservoir of unrecoverable oil, they began to ask questions about the physical characteristics of the pay sand and the economics of unitized water floods.

Refiners run too. They don't run to a new area play, but they run crude through their stills as fast as they can get it—particularly if other refiners seem to be doing the same thing. Then later they ask questions about how they are going to get rid of their surplus stocks of gasoline and fuel oil.

This should be enough examples to establish our point about the herd instinct of oil men.

The reason for doing so is to lay the groundwork for a little bragging.

In the November 23 issue the Journal carried an editorial entitled "Oil's biggest need is responsible management," which listed some specifications for a good oil-company executive. It said, in effect, that industry leaders ought to get on the ball.

Now it has come to our attention that the president of a major oil company has sent copies of that editorial to all his top officials, together with a letter which said, in part:

"This editorial, in my opinion, provides considerable food for thought when applied from a 'self-analysis' standpoint. It is being sent to you with the idea that it might prove helpful to each of us. I feel that it has helped me.

"Perhaps the point that impressed me most in this editorial was the highlighting of the quality of leadership which is necessary in the management of today's larger enterprises. I personally intend to accept the challenge which is raised in this editorial. . . .

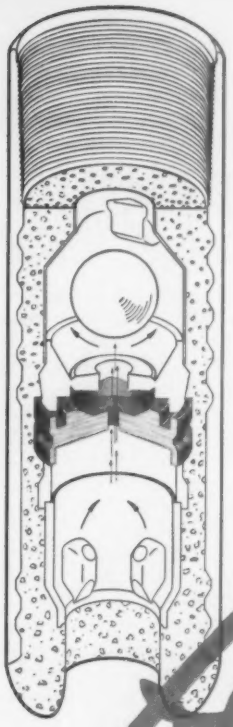
"The question for each of us to ask ourselves is whether or not we are living up to the leadership imposed on us and which we are capable of exercising."

So here is one oil man laying down a policy of asking questions about which way to run.

Wouldn't 1960 be a great year for the industry if all oil men's herd instinct caused them to run after this man's precedent — to ask questions about the quality of their leadership and then run in the direction of responsible management?

The Big Yellow Book would be quite proud to feel that it had touched off that kind of stampede.

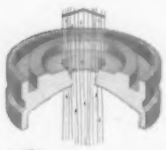
—Henry D. Ralph.



HERE'S HOW the FLEXIFLOW Variable Valve automatically fills casing from the bottom...

A When casing is lowered, pressure from below causes the hole in the reinforced synthetic rubber disc to open wider, and fluid enters the casing, thus preventing build-up of pressure surges.

B As the rate of lowering the casing is slowed down (to set the joint in the slips) pressure from below decreases; the hole in the Variable Valve diaphragm contracts; fluid volume entering the casing is reduced and overfill is avoided.



ECONOMICAL

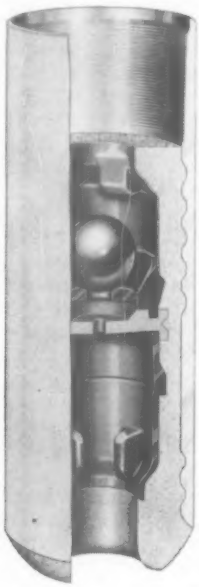
flexiflow

AUTOMATIC FILL-UP MEANS

NO SURFACE FILLING

CASING ON BOTTOM SAFER AND FASTER

PROTECTION OF PRODUCTIVITY



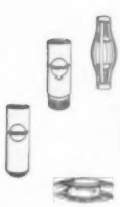
When pressure builds up as casing is lowered in the well, the Variable Valve in Baker FLEXIFLOW Shoes and Collars automatically opens wider and prevents pressure surges by permitting a large volume of fluid to enter the casing. As the rate of lowering is slowed down, pressure from below is lessened and the Variable Valve contracts to restrict fluid entry and prevent overfill. This automatic opening and closing action balances the *rate of fill* with the *rate of lowering* and prevents build-up of dangerous pressure surges.

Casing running time can be greatly reduced because Baker FLEXIFLOW Shoes and Collars save the time otherwise wasted in surface filling; and automatic "fill" permits the casing to be run faster without danger of damaging the formation by high-pressure surges. A back-pressure valve, for floating or cementing, is actuated by pressuring the casing.

Ask any Baker representative how FLEXIFLOW Shoes and Collars (Regular or Circulating Type), used in combination with Baker CASING CENTRALIZERS and Baker WALL SCRATCHERS, bring you the safety and savings of Baker "Protective" Cementing.

BAKER OIL TOOLS, INC.
HOUSTON • LOS ANGELES • NEW YORK

For MORE than a good cement job, use Baker *FLEXIFLOW* Shoes and Collars in combination with Baker Casing Centralizers and Baker Wall Scratchers. *Available through your supply store.*



BAKER FLEXIFLOW
SHOES AND COLLARS

Why conservation rules need an overhauling

THIS JOURNAL has frequently said that many state conservation laws and practices need to be overhauled and modernized to make them fit today's conditions of overcapacity and high costs.

On page 41 of this issue is an article spelling out some specific examples of this in Texas and Louisiana, our two biggest producing states.

It reveals a widespread belief that the U. S. producing industry cannot cut its costs enough to be competitive with foreign crude without some rather sweeping changes in state regulatory practices.

BOTH STATES BOAST of their market-demand proration. But the way their proration works out in practice is far short of a model that other states would care to emulate.

A major objective of proration is to spread the available market equitably among fields and wells. This is not achieved in Texas and Louisiana, and perhaps not elsewhere.

The formulas for well allowables, when applied together with a maze of spacing regulations, special field rules, and exemptions of many kinds, frequently flout the principles of ratable take and the protection of correlative rights.

Worse, perhaps, is the fact that they encourage or even force drilling wells just to get an allowable—wells that find no new oil and do not increase the potential or ultimate recovery from the reservoir.

This comes close to abnegation of a state's fundamental conservation obligation to husband the nation's petroleum resources by preventing physical waste. Certainly it fosters economic waste and conflicts with the industry's need for over-all economy and efficiency.

Such regulatory practices simply increase current producing capacity (but not future reserves) at a time when excess capacity is the industry's biggest burden. So allowables per well keep going down in a vicious circle, and all wells become marginal.

Present regulations often make a good well so marginal that the only way to a payout is to drill a second well to get another allowable—when the first well could have produced the same volume at less cost.

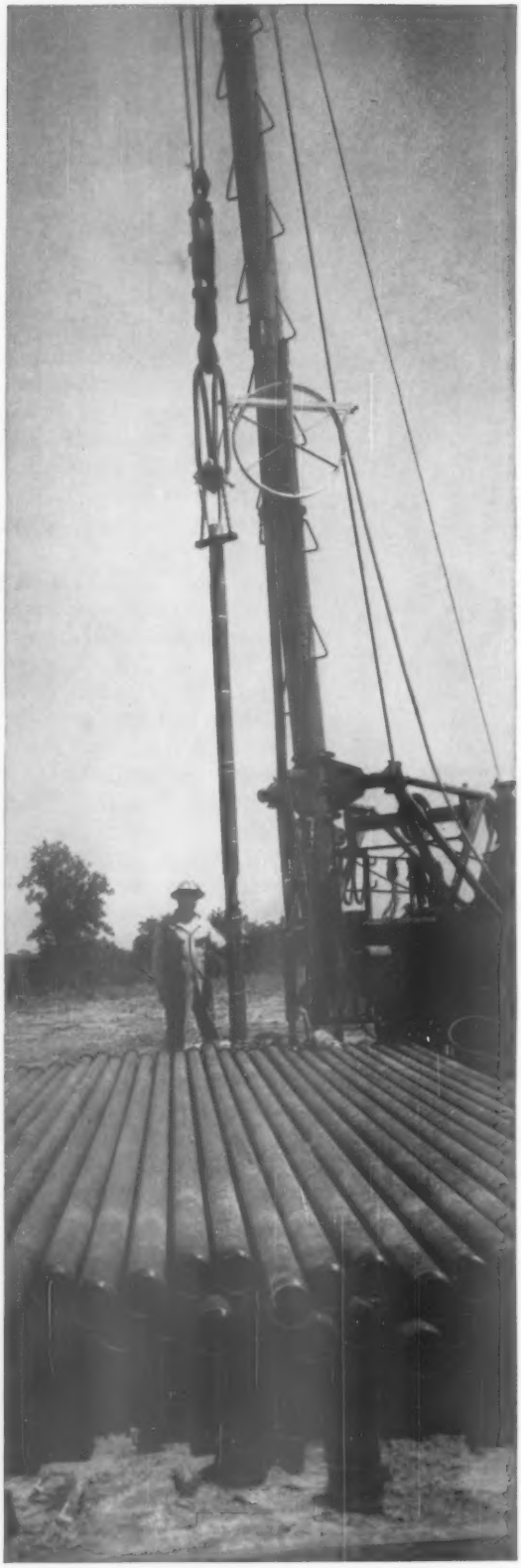
THIS IS INCONGRUOUS. It is an example of regulation working against its own purposes and defeating its intended objectives.

The general body of so-called conservation rules is too often a hodgepodge accumulation of expediencies, inconsistencies, piecemeal temporizings, local experiments, and obsolete concepts.

The "big picture" has been lost. The need today is a critical reexamination of regulatory rules with a view to keeping domestic oil-producing costs as low as possible consistent with the national objectives of maximum ultimate recovery and the discovery of new reserves.

This Submergible Pump handles corrosive salt water for injection. Does its job dependably with "K" Monel alloy pump shaft, Ni-Resist* diffusers, Monel-armored cable. Made by Reda Pump Company, Bartlesville, Oklahoma.

Submergible pump takes long drink of carbonated salt water ...uses "K" Monel shaft



This Reda pump takes a 1400-foot "drink" of carbon dioxide-containing water — economically raises it that distance for injection into a lease in central Oklahoma. The corrosive water doesn't chew up the pump shaft — it's made of "K" Monel* age-hardenable nickel-copper alloy. Turns in extra service, too, because of its extra strength.

The Reda multistage centrifugal pump is widely used to pump oil or water under severe conditions. It pumps sandy wells . . . gassy or paraffin-bearing wells . . . crooked wells. Most of all — corrosive wells.

This pump's "K" Monel alloy shaft and Ni-Resist ductile iron parts make it unusually resistant to corrosion by sulfur-bearing crudes and acidic brines. Together with high capacity and low operating cost, this corrosion-resistance enables the pump to extend greatly economic well life. The cable supplying power to the pump is clad with Monel* nickel-copper alloy tape for extra protection against corrosion and wear.

If you have corrosion problems, you can get tools built with Inco Nickel Alloys at vital points . . . these alloys have excellent strength, too. Check your tool supplier.

See how other producers combat corrosion with Inco Nickel Alloys. Write for "Metals to Make Petroleum Production Equipment Produce More."

*Inco trademark

HUNTINGTON ALLOY PRODUCTS DIVISION
The International Nickel Company, Inc.
67 Wall Street New York 5, N. Y.

"K" MONEL®

Part 1

Costs Can Be Cut in Texas, Louisiana

• Laws and regulations have become outdated, say oil men; they now encourage waste instead of conservation. At stake are millions of dollars now being poured into unnecessary wells. These could be diverted to find new reserves, but not until some of the ground rules are changed.

Robert J. Enright
Dallas District Editor

Editor's note: Cost cutting is the goal of oil men everywhere. Advances in technology are helping. So are the reorganizations to trim overhead. But one area where little has been done is the field of regulation.

This is the first of a two-part report on problems oil men are facing in the nation's two biggest producing states. It represents many weeks of interviews with major company executives and independent producers. It shows, in brief, that there's still room for major cost-cutting, but it will take some help from lawmakers and conservation agencies.

THE BURDENSOME oil surplus here and abroad has triggered a great and growing need in the U. S. for a studied modernizing of state oil and gas laws and regulations.

American companies are finding it more and more difficult to make reasonable profits from domestic operations in the current age of soaring costs and depressed income.

The wave of corporate reorganizations and mergers, the decentralizations, and general decrease in operating offices during the past year are ample evidence that the domestic industry is suffering real pain in attempting to compete with foreign oil.

These measures will help. But thinking operators are convinced that paring off the structural fat they've accumulated during better years, plus cutting costs as best they can via use of modern techniques, isn't enough. They need outside help—from state conservation agencies and, in a few cases, legislatures.

For oil's government in many places hasn't kept pace with the times.

A Journal study shows essentially unanimous feeling among larger operators that there is a dire need for a general revising of unsound oil laws and policies in the producing states. Some of these are costing the domestic industry hundreds of millions of dollars in useless expenses.

There is real room here for improving the industry's competitive position in the world oil market and in assisting it to ride out a prolonged period of surplus.

And it is the last place left to look.

The need for basic changes in regulatory systems to permit domestic operators to produce oil cheaper is great in nearly all states. But it is the greatest in such states as Texas and Louisiana, for the simple reason that the bulk of the nation's oil is produced in these states.

Present policies and laws in the big oil states leave much to be desired, operators feel, in the broad areas of allocation of production, well spacing, pooling of properties, ratable take between fields and within fields in some cases, well and field classifications, and in applying rules.

The shortcomings, most agree, however, are intertwined and interrelated and nearly all stem from one major fault—that the Texas and Louisiana regulatory systems basically encourage the operator to drill a well merely for the allowable.

In many hundreds of cases this well isn't needed to produce the oil from a reservoir. It will not add a drop of oil to total recovery from the pool.

This well is drilled by the operator —even though he knows he could produce the same oil from other wells already drilled—because he has to do it to get allowable.

1. Allowable formulas

Market is allocated under present Texas and Louisiana systems largely on the basis of depth and holes in the ground. Reserves in place or acreage or the-most-oil-at-least-cost concept have no bearing in Louisiana and little in Texas.

Louisiana's yardstick is based entirely on depth. In other words, an operator can drill a well on 20, 40, 80 or more acres and will get the same allowable in each case. If he drills two wells on his tract instead of one, he gets double the allowable

How Allowables Work in Texas, Louisiana

Texas' 1947 Yardstick Allowable (Producing Days*)

Credit for wider spacing is 1 bbl. per acre

Depth	10 Acres	20 acres	40 Acres	80 Acres	160 Acres
0- 1,000	18	28			
1,000- 1,500	27	37	57	97	177
1,500- 2,000	36	46	66	106	186
2,000- 3,000	45	55	75	115	195
3,000- 4,000	54	64	84	124	204
4,000- 5,000	63	73	93	133	213
5,000- 6,000	72	82	102	142	222
6,000- 7,000	81	91	111	151	231
7,000- 8,000	91	101	121	161	241
8,000- 8,500	103	113	133	173	253
8,500- 9,000	112	122	142	182	262
9,000- 9,500	127	137	157	197	277
9,500-10,000	152	162	182	222	302
10,000-10,500	190	210	230	270	350
10,500-11,000		225	245	285	365
11,000-11,500		255	275	315	395
11,500-12,000		290	310	350	430
12,000-12,500		330	350	390	470
12,500-13,000		375	395	435	515
13,000-13,500		425	445	485	565
13,500-14,000		480	500	540	620
14,000-14,500		540	560	600	680

Louisiana's November-December Allowable (Calendar Days)

No allowable credit granted for wider spacing.

ONSHORE		OFFSHORE	
Depth	Allowable	Depth	Allowable
0- 2,000	27	0- 2,000	65
2,000- 3,000	32	2,000- 3,000	72
3,000- 4,000	39	3,000- 4,000	82
4,000- 5,000	46	4,000- 5,000	91
5,000- 6,000	54	5,000- 6,000	100
6,000- 7,000	63	6,000- 7,000	112
7,000- 8,000	73	7,000- 8,000	129
8,000- 9,000	81	8,000- 9,000	141
9,000-10,000	93	9,000-10,000	157
10,000-11,000	105	10,000-11,000	173
11,000-12,000	118	11,000-12,000	190
12,000-13,000	130	12,000-13,000	205
13,000-14,000	147	13,000-14,000	228
14,000-15,000	164	14,000-15,000	249
15,000-16,000	189	15,000-16,000	282
16,000-17,000	228	16,000-17,000	333
17,000-18,000	259		
18,000-19,000	292		
19,000-20,000	333		
20,000-21,000	380		

*To convert Texas' yardstick allowable to calendar days, multiply the producing-day allowable by the number of producing days set for the month. Then, divide the product by the number of calendar days. The result is the calendar-day production for a well.

—three wells get triple the allowable.

Texas gives some credit for acreage in its depth yardstick (a barrel of allowable per each added acre) but so little as to not noticeably alter the pressure for spacing wells close together.

For instance, a Texas operator with an 80-acre lease completes a 10,000-ft. producer on that lease. The yardstick allowable for an 80-acre well at that depth is 270 bbl. a day. In most fields one well, engineers say, is capable of draining much more than 80 acres.

However, to get more allowable under the Texas system the operator more often will drill more than 1 well. If he drills two wells on his 80 acres (40-acre spacing), he can get a 230-bbl. allowable for each—for a total of 460 bbl. a day.

For a well on 20 acres at the same depth, the yardstick allowable is 210 bbl. a day. Thus, on 20-acre spacing, he would be allowed to produce a total 840 bbl. a day.

Texas follows up this initial incentive for drilling unneeded wells in its MER system of allocation by giving heavy weight to the well factor in the bulk of the individual field allocation formulas it approves.

The effects . . . The over-all effect is to stimulate the drilling of thousands of unneeded wells.

The millions of dollars that are sunk in these holes, operators agree, otherwise could and would be spent in exploration.

As it is, the available oil market is spread increasingly thinner among a host of development wells. In Texas, producing capacity is growing rapidly and out of proportion with its reserves, which are not climbing.

In the past 4 years, one operator points out, the number of producing wells in Texas has zoomed from roughly 158,600 at the first of 1956 to roughly 193,300 at the first of 1960.

This is eloquent, he says, when you consider that Texas' petroleum reserves haven't gained at all. According to API-AGA figures, Texas oil reserves fell more than 400,000,000 bbl. while gas reserves gained 8 trillion cubic feet from the first of 1956 to the first of 1959. When 1959 figures become available, they are not expected to look any brighter.

This is ironic. Operators are induced by incentives in the system to drill for allowable. But the more they drill, the further allowables over the state are depressed in that more and more wells must divide a relatively static market.

2. The money involved

The cost of past and current overdevelopment is staggering.

You can pick out any number of examples.

Take Lake Washington field in Louisiana, for example. Here is a prolific reservoir with good porosity which could be drained efficiently on wide spacing.

However, the field is developed on 10 acres. Lake Washington wells cost about $200,000 each. If this field had been developed on 40 acre spacing, an engineering study by one company familiar with the field shows operators there would have saved at least $13,000,000.

This same situation, they contend, repeats itself again and again in nearly every field in the two states.

These unneeded wells on close spacing are not drilled just because the state agencies will not permit wider

spacing. And members of these agencies have been quick to point out that it is the operators themselves who determine what spacing will be in most fields. They point out, too, that they have approved wide spacing before and will continue to do so when operators seek it.

But the operators contend the deck is stacked against wide spacing by rules that economically force the operator to overdrill to get the allowable if the reservoir is good enough to see a payout for the added well.

The result, one engineer says, is that operators drill on wide spacing only where a reservoir is so sorry that they can't pay out the wells on narrow spacing. He finds this, again, ironic in that it is in the best pools where wide spacing could best be utilized. And it is only in the very poor fields where close spacing is, if ever, technologically justified.

3. The solution

As one prominent proration engineer puts it, "The day when Texas and Louisiana can afford such luxuries is over."

Most agree that what is done can't be undone and that basic changes in the regulatory systems should, in most cases, apply only to future operations. They agree too that the change most vital is to remove the incentive to overdrill for allowable.

Most large companies say they would go for anything that would tend to do this. Suggestions include allocation on the basis of reserves and on acreage.

There is agreement among most that allocation on the basis of reserves would be the ultimate. That would mean distributing allowable on the basis of net acre-feet of pay, oil-in-place, and gross acre-feet of pay. Such a system, however, would be unwieldly. And it would have the drawback that figures on these factors would always be subject to argument and various interpretation.

Thus, a majority of the operators contacted by the Journal, which included both majors and independents, favor allocation on the basis of acreage. This, they feel, is the closest practical approach to allocation on a reserve basis—as well as being the only such method not subject to finagling and interpretation.

Here are the solutions offered by four companies:

... Company A says: "We can't just upset the past 25 years of regulation, but we can revise it—turn the ship around and rehead it for the good of conservation and the industry. We have to remove the incentive for drilling unneeded wells. Acreage, thickness, fence posts—we're in favor of anything that will accomplish this end."

... Company B, however, is staunchly in favor of allocation on the basis of reserves in place. The only reasonable way to accomplish this, it feels, is to "start over."

"Production should be proportioned among all wells on the basis of reserves.The commission would be empowered to grant hardship allowable where the workings of this system would make operation of stripper wells uneconomic."

This operator, nevertheless, also feels that acreage allocation, though not so desirable, would be a tremendous improvement.

... Company C would like to see allocation on the basis of reserves if it were practical. But it feels it is not practical and that acreage is the next best thing.

... Company D wants to retain the present system but revise the yardsticks to adequately reflect acreage and at the same time to wipe out the well factor in allocation formulas.

And so on.

Acreage allocation is the answer, most feel, to the present situation where there is much talk but little action on wider spacing.

Company A points out that of 20,767 wells drilled in Texas in 1958 more than 76% (15,829) were drilled on 20 acres or less.

It feels that there will be little change in the percentage for 1959 when complete drilling figures are in and can be tabulated. "This," a top engineer for this firm says, "is what is really eating us up."

•

NEXT WEEK: Is Texas' marginal-well law equitable? Are the allowables too high in older fields? When does a well become a limited-capacity producer in Texas? These are some of the subjects which will be discussed in the Journal next week in the second part of this study on cutting costs by improving regulations.

Texas Gas Gains Outshine Oil in Spotty 1959

PRODUCTION climbed some in Texas in 1959, the Texas Railroad Commission reported last week. But drilling and exploration declined a bit.

Preliminary figures for 1959 show crude-oil production totaling 942,044,000 bbl. This is 32,086,442 bbl. or 3.5% higher than the total for 1958.

Meanwhile, total well completions in the state, the commission said, were 20,423—off 114 from 1958. Oil completions fell 58 wells to 12,210, gas completions down 22 to 2,075, and there were 34 fewer dry holes at 6,138.

Operators, the commission said, put down 4,100 wildcats—6 fewer than in 1958. Of the total, 377 were completed as oil discoveries (against 373 in 1958), 65 as gas discoveries against 64 in 1958, and 3,658 as dry holes against 3,669 in 1958.

Gains in gas . . . Gas production continued to zoom in Texas in 1959. Estimated total gas production for the year was 6.410 trillion cubic feet as against 6.050 trillion cubic feet.

Of the total 1.714 trillion was casinghead and 4.696 trillion was dry gas. This compares with production of 1.667 trillion cubic feet of casinghead and 4.383 trillion cubic feet of dry gas in 1958.

The hike in production of gas and LPG in 1959 "of course had a diminishing effect on oil demand in a very real way," the commission said. "But, it (the gain in gas) is a true waste-prevention measure and is the fruit of our conservation program."

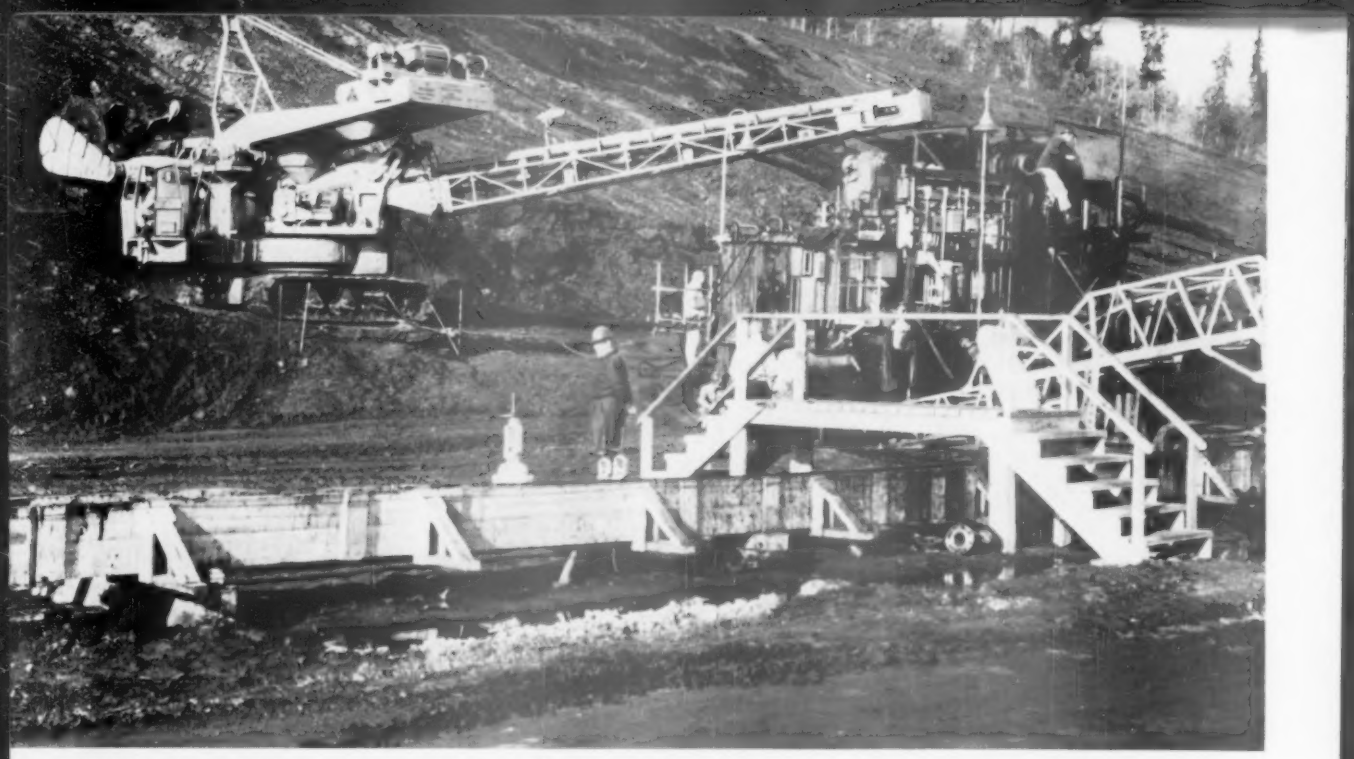
The gain in liquefied petroleum gases totaled 16,384,055 bbl., from 194,424,613 bbl. in 1958 to 210,808,668 bbl. in 1959.

The number of gasoline plants in the state climbed 3 to total 213 during the year. Cycling plants held steady at 27. Carbon-black plants gained 2 to total 17. And pressure-maintenance and repressuring plants fell off 3 to 126.

At the end of the year, Texas boasted 23,266 gas wells, with 17,155 of them producing. The producing wells were active in 6,252 separate reservoirs in 2,370 fields. This compares with 15,349 wells producing from 5,639 reservoirs in 2,210 fields in 1958.

Texas refineries processed a total of 928,129,175 bbl. of crude oil in 1959—up from 872,064,833 bbl. in 1958.

Products increased accordingly, from 842,261,816 bbl. in 1958 to 902,517,249 in 1959.



HEART of the experiment is this setup. At left is the Krupp mining wheel which scoops oil sand and feeds it by conveyor belt to the mobile extraction unit at right. This unit separates the oil by solvent action and returns clean sand to the escarpment.

Four-Company Team Tackles Athabasca

• New mining equipment, new processing equipment are producing oil in a big research project aimed at making tar-sand production commercial. If it works, there's a 300-billion barrel supply awaiting developers.

THE VAST reserves locked in Alberta's Athabasca oil sands cannot yet compete with petroleum.

But four oil companies, recently joined in a major research effort, are betting millions of dollars that they will be able to produce commercial oil with some new techniques they are trying.

This most comprehensive venture yet includes Imperial Oil Ltd., Cities Service Athabasca, Inc., Richfield Oil Corp. and Royalite Oil Co., Ltd. Royalite holds a 10% interest in the new firm, the other three, 30% each.

In announcing their joint project last week, the companies revealed new details of a large-scale pilot plant which has been mining, extracting, and processing Athabasca oil at Mildred Lake since last August.

The project promises some new breakthroughs in the tough economics of handling, recovering, and preparing this bitumen reserve for commercial use.

New techniques . . . Prominent among these innovations is a new German mining wheel, a mobile extraction unit, and a combination visbreaker and distillation plant.

Operations at this project, 30 miles north of McMurray, are producing cost data and technical knowhow. If they prove successful, a massive scale-up on a commercial basis is indicated.

The mining wheel looks like a winner. The mining world was searched for equipment which could be adapted to large-scale low-cost handling of the oil sand. In the Ruhr Valley, Cities Service found gigantic Krupp devices mining up to 143,000 cu. yd. of brown coal per day.

A small experimental version handling 9,600 cu. yd. per day was designed specially for the Athabasca project. Six buckets attached to a huge wheel dig into the mining face and drop their load on a conveyor belt which transfers oil sand directly to an extraction unit.

A 38-ft. tail boom supports the conveyor belt which delivers sand to the mobile extractor.

Diluent-water extraction . . . The self-propelled extractor moves with the mining equipment.

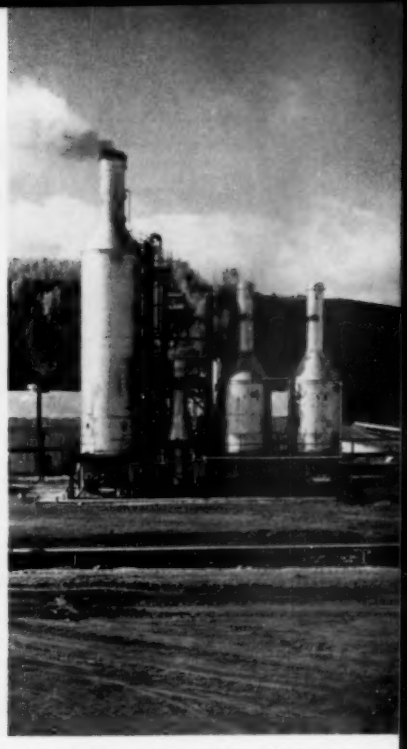
First it separates rocks and foreign material from the oil sand. Next, a solvent or diluent is added. This light hydrocarbon, an oil-sand product, reduces viscosity and specific gravity of the bitumen.

Hot water is then added, precipitating the sand. Completely stripped, the clean white sand is returned to the escarpment area. The mixture of diluent, water and bitumen is piped from the extraction unit to a separation plant where the oily mixture is decanted and fed to the refinery. Water is treated and recycled to the extractor.

The pilot refinery comprises visbreaking and fractionation equipment. It will handle 3,000 bbl. per day of oil mixture composed of 67% diluent and 33% bitumen. The diluent is flashed off at atmospheric pressure and recycled to the extraction unit.

The virgin bitumen has a gravity of 7.5° API and is solid at normal temperature. It's 50% point on distillation is about 1,000° F. It con-

MINING WHEEL digs and moves 9,600 cu. yd. of oil sand a day. It is modeled after one used in Germany's brown coal fields which moves 143,000 cu. yd. daily.



LAST STEP is this pilot refinery, which visbreaks the oil to produce crude oil and diluent makeup.

tains 5% sulfur and about 200 p.p.m. of vanadium.

Because of the high sulfur content, it is probable that this bitumen will require hydrogenation for conversion to commercial fuels. The group is now doing research on this subject.

For the present, however, the heavy oil is charged to a visbreaker designed and prefabricated by M. W. Kellogg Co. and assembled at Mildred Lake. The feed passes two furnaces in series and is quenched in a soaking drum. Light cracked gas is flared from the separator, and the cracked liquid is fractionated into diluent for the extraction process, naphtha, bitumen, and visbreaker liquid.

All furnaces in the refinery are fired with steam-atomized virgin bitumen. The electrified plant is powered by two diesel generator units.

Vast reserves await . . . Giant Athabasca has intrigued and frustrated oil men for 50 years.

It comprises some 30,000 sq. miles of unconsolidated sand mixed with a heavy bitumen. Hydrocarbon reserve estimates range up to 300 billion barrels—equal to the world's total crude reserves.

How much of this is readily available at or near the surface is a matter of mixed opinion. The Research Council of Alberta last week announced that only 5 billion barrels are located in areas favorable for economic development by open-pit methods.

The four-company group, however, states that 40 billion barrels lie at or near the surface. This roughly equals total crude reserves in North America.

The new partnership pools plenty of experience at Athabasca. Three years ago Cities Service and Royalite were working intensively at the problem. Royalite had done extensive coring on a 50,000-acre lease at Mildred Lake. Cities Service began laboratory and bench-scale studies of a number of extraction methods.

Imperial entered the partnership with Royalite and Cities Service in October, and Richfield came in last month.

In the Mildred Lake area the sands lie in an escarpment along the Athabasca River. They vary from 150 to 200 ft. in thickness and are topped by an overburden ranging from 25 to 100 ft. thick.

The oil sand contains some relatively thin clay lenses devoid of oil. In some areas, the deposit is almost pure bitumen. On the average, the sand shows a 10% bitumen content by weight.

Many schemes tried . . . The diluent-hot water method of extraction was selected after several others were investigated.

Retorting, centrifugal separation, sonic methods, and even atomic blasting have been considered.

Alberta's Research Council built two small pilot plants near Edmonton as early as the 1920's. In 1944 a pilot plant was located at Bitumount, where the hot-water flotation process was thoroughly tested.

Royalite and Can-Amera Oil Sands Development, Ltd., bought the Bitumount plant in 1953 and adapted it to the Coulson centrifugal process. For a time this looked promising, and in 1957 Royalite announced plans for a $50 million project, including a plant and a pipeline. But the project never came off.

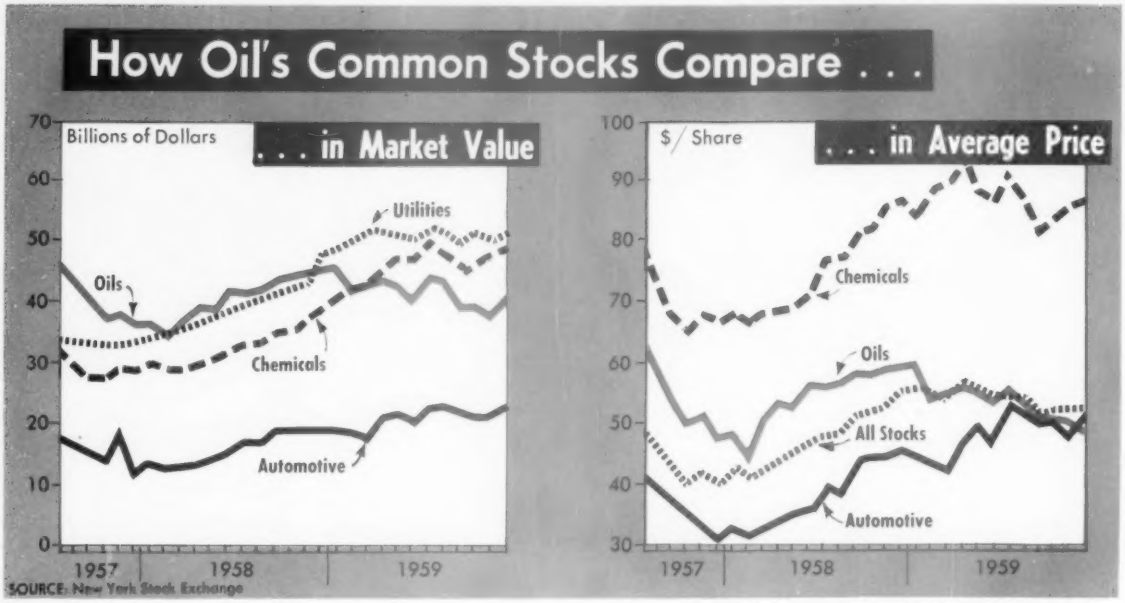
In the same year Sonic Oil Co. appeared with a process designed to jar the oil loose by highly pitched sound-wave bombardment. Little has been heard from this direction.

More recently, Athabasca became an international issue when underground atomic blasts were proposed by Richfield, the government, and others. The world moratorium on atomic explosions delayed this proposal, and its ultimate outcome is now a question.

The big question: Cost . . . None of the new partners in this most recent and largest project is discussing costs.

The pilot plant at Mildred Lake represents $3,500,000. Its operation will be closely tallied to determine whether a major scale-up can prove economic.

Operator is Cities Service Co.'s subsidiary, with headquarters at Edmonton. A. P. Frame is president of Cities Service Athabasca, and vice president and general manager is Lee N. Haugen.



Oil Stocks Are Down, But Not Out

John P. O'Donnell
District Editor

OILS definitely are no longer the glamor buys of the stock exchange.

And, until conditions that tumbled them from their exalted position are corrected, there is little likelihood that they will regain their role as the No. 1 choice of investors.

But, grim as the situation appears, there is some cautious optimism about oils. This optimism is due not so much to strengthening in oils as to signs of weakening in other stocks.

The beating oils have taken in recent months has tended to strengthen their price-earnings ratio. Other stocks, continuing on their relatively merry way, are showing signs of a deteriorating price-earnings ratio. Thus, oils are looking a shade more attractive to investors.

Oils look somewhat better, too, as a result of the belt-tightening that has gone on within the industry. This, along with somewhat lower capital investments, is expected to help earnings in 1960.

These slightly encouraging developments, however, are not enough to offset the big problems of the industry—oversupply and lack of self-control. There isn't much the oil industry can do about the problem of oversupply of crude oil but live with it. Observers expect it to disappear as demand grows.

Investors, as one of them puts it, are "disgusted" with the industry's lack of self-control. They look back on overproduction of crude and refined products in the last couple of years and are fearful that this condition will be repeated this year. They are skeptical of the industry's current efforts to bring supply and demand into line. That skepticism will continue until the heating-oil season ends.

Here's what such conditions did to oil stocks in 1959:

. . . **Market value** of all oil stocks dropped from $45.5 billion in January to $40.8 billion in December. While oil stocks dropped about 10% in value, practically every other industrial group gained during the year.

. . . **Average price** of oil stocks dropped from $59.96 per share in January to $48.68 in December. That was a drop of more than $11 per share, compared with a decrease of only $2.72 a share for all stocks.

Downward trend . . . Two years ago, oil stocks were still the preferred buy of investors. In February 1958, utilities eased ahead of them, and in February 1959, chemicals also passed the oils. Oils are now a poor third.

Before the sharp drop in mid-1957, oils were far out in front in total market value. In July 1957, the total value of oil stocks traded on the New York Stock Exchange added up to $46 billion. In those days, they represented better than 23% of the value of all stocks traded on the exchange. At the end of 1959, this percentage had dropped to less than 13.

The per-share price of oil stocks also took a beating during the year. Back in January 1959, they had made a good recovery from the low point of early 1958. They dropped consistently during 1959 and ended up below $50. That was 20% lower than 12 months earlier.

In the tailend of the glamor days, in mid-1957, oil-stock prices averaged $63 per share. They dropped to under $47 in early 1958, but by January 1959, they had climbed back to almost $60. The end of December 1959 found the average back down to $48.68.

This put oil stocks at an "average" level. Instead of being $15 above the average as they were in mid-1957, oils were actually a few dollars under the average price for all stocks at the beginning of 1960. And, while oils were under $50, chemicals had climbed almost to $90.

But oils ended last year on an encouraging note. Their total value went up 5% in December to bring them to their highest level since last April. The average price did go down in December, but this was due to a large jump in the number of oil shares outstanding. They jumped from 766 million to 837 million, largely as a result of Gulf's 3 for 1 split.

Amoco to Keep Work Control at Texas City

• Union says it got "clarification" of contract provisions, but management wound up with what it wanted—freedom to assign work to improve efficiency.

NEITHER management nor labor is claiming victory in the settlement of the 191-day strike at the Texas City refinery of American Oil Co.

The reason is simple: The big job at hand now is to repair feelings damaged by one of the longest, costliest, and most futile strikes in the history of the oil industry.

But the contract terms show it to be an almost complete victory for management.

The union won minor improvements in such matters as funeral leave, holiday pay, and severance benefits.

The company retained its right to prescribe the work to be done in each job classification and to determine the qualifications necessary to perform each job. The union had demanded that the classifications in the 1957 contract be reinstated and that they be subjected to change only by mutual agreement (OGJ, Aug. 31, 1959, p. 30).

More important, Amoco got a change in the clause governing temporary work assignments (See box). The new clause permits the company to assign men to small jobs outside their regular classification if the jobs are incidental to their main work.

Both the company and union say the new clause is advantageous. Management says it spells out the flexibility allowed it in assigning duties. The union says this has always been recognized, but the new clause "destroys the uncertainty as to how far the company can go."

The settlement . . . Involved in the long dispute were 42 union bargaining points. Counting subdivisions, the total was 72.

In the final contract, 55 provisions or issues were left unchanged, the company stand was approved in 10, the union stand was approved in 3, and 4 were left for future disposition.

Here are the three points won by the union in the 45 bargaining sessions:

. . . Funeral leaves. Amoco grants time with pay for funerals of an employe's "immediate family." The new contract adds sister-in-law and brother-in-law to the definition of "immediate family."

. . . Discipline cases. Those may now be submitted to arbitration if the union or employe is dissatisfied with the plant manager's ruling.

. . . Temporary vacancies. The method of filing vacancies in the mechanical department, covered by a stipulation to the 1952 contract, was made a part of the new contract.

There were two other union gains. The company refused additional holidays but agreed to pay time and a half for the first 8 hours and double time and a half beyond that. And it put into the contract its severance plan previously used in layoffs.

These were the gains of the union in the 191-day strike which cost its members an estimated $4,200,000 in wages.

Here are some of the principal union demands which went by the boards:

. . . Deletion of the preamble to the contract. This expressed hope for "a standard of company-employe relations which will yield maximum efficiency . . ." in the refinery.

. . . Deletion of the union responsibility clause, in which the union agreed to "encourage a full day's work for a full day's pay."

. . . Deletion of a section governing classification of work, job definitions and job standards. This section recognized these functions as being "among the rights of management which are not intended to be impaired . . ."

But the article permitting management the right to assign work of a different classification was the touchiest point at issue. And it was here that the company won its biggest concession.

Outside view . . . While Amoco and the union expressed only "satisfaction" with the contract, other companies were more outspoken.

They regard the outcome as a significant victory for Amoco in the issue over whether labor or management shall manage a plant.

They also interpret the outcome as a severe blow in prestige to the OCAW. Coming on top of its capitulation at El Dorado and its defeat at Baton Rouge, OCAW may have suffered greatly in the esteem of its members, they feel.

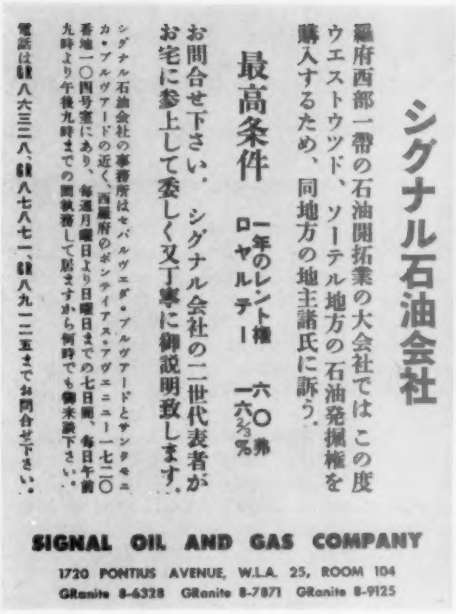
How the Work Clause Changed (New language in bold type)

The old

"Work peculiar to a classification shall be done by employes regularly assigned to that classification. It is understood, however, that due to the nature of refinery operations, employes may be required temporarily to perform work of classifications to which they are not regularly assigned. When an employe is formally assigned to a split classification, he shall receive the applicable rate for such work as he performs in each classification."

The new

"Work peculiar to a classification shall be performed by employes regularly assigned to that classification, **provided that when there is no work required of an employe in his regular classification, he may be assigned to perform work of an equal or lower rate in another classification so long as employes of some other classification are not performing such employe's regular work.** It is understood, however, **that to expedite the job at hand in a reasonable and efficient manner,** an employe may be required to perform temporarily jobs of another classification. When an employe is formally assigned to a split classification, he shall receive the applicable rate for such work as he performs in each classification."



ADS IN JAPANESE-language newspapers . . .

HELP SIGN UP property owners in Los Angeles.

Los Angeles Scene of Hot Lease Play

• Signal and Continental waging stiff competition for town-lot leases after two finds set off play on west side. Both sides expected to win.

THE BIGGEST town-lot leasing race in California's history has been touched off by a couple of highly productive discoveries in Los Angeles' west side.

The main contestants are Signal Oil & Gas Co., as operator for itself and Richfield Oil Corp., vs. Continental Oil Co.

Although the race isn't over, indications are that everyone will win. Both Signal-Richfield and Continental have been highly successful in leasing and finding oil.

Most of the activity is concentrated in two areas—Culver City and West Los Angeles extension—about 3 miles apart on the west side of town.

Continental kicked off the boom in the Culver City area by signing up both the M-G-M and Desilu film properties. Continental has approximately 850 acres under lease in Culver City, involving more than 3,000 separate leases.

Continental's acreage has already been credited with producing state's biggest discovery last year with a 720-bbl.-daily wildcat on the M-G-M property in late November (OGJ, Nov. 30, p. 42). The Culver City field discovery was perforated in a zone between 8,660-8,807 ft. The crude tested at 24.4° gravity.

A second well is under way on the same site from which the discovery was drilled, and another rig will be put to work shortly developing the adjoining town-lot areas by slant drilling.

Signal is expected to join the play soon. The Culver City council granted Signal a permit to drill 13 wells from a site about ½ mile east of Continental's activity. Signal has acquired strategically located acreage adjacent to the M-G-M lot, as well as all the leases of Federal Oil Co. and Aladdin Oil Co. in the area.

Signal and Continental also have locked horns in the West Los Angeles extension area northwest of the productive Rancho and Hillcrest golf courses.

Signal has around 5,000 individual leases covering more than 1,500 acres in the extension area. In the adjoining main area, including the two golf courses, Signal has more than 15,000 pieces of property under lease involving more than 12,000 individual leases. This play comprises approximately 3,500 acres.

Impetus for this phase of the West Los Angeles lease race was Signal's successful drilling programs on the two golf courses. A sixth well on the public Rancho course and the third on the neighboring private Hillcrest course are being drilled by Signal. Going back further, the two golf course plays resulted largely from Universal Consolidated Oil Co.'s discoveries on the nearby 20th Century Fox movie property a couple of years ago.

One hazard of such town-lot leasing races is that competitors tie up so many unconnected pieces of property that no one can put together enough acreage for a drilling district.

Under Los Angeles city law, urban drilling districts must cover at least 40 acres. Judging from results thus far, it appears that Signal and Continental are going to have to get together in the Westwood-Sawtelle extension area before either can put together 40 acres of connected town lots.

Town-lot leasing methods . . . With competition so hot, operators have developed a number of unique and interesting techniques for sewing up acreage.

A study of Signal's operations offers some interesting insights into such activity.

As soon as the desired area is blocked out and ownerships confirmed, Signal mails each property owner a letter and booklet explaining what's going on, a standard lease form, and a check

for the first year's rental—usually $10 to $60, depending on the location.

Signal usually gets about 25% of the leases signed and returned by mail within a couple of days. Several days after the mailing, Signal hires a crew of landmen and goes to work picking up the leases individually. When this crew is finished, in a couple of weeks, usually about 75% are signed up. Another 20% usually sign up in subsequent months, leaving only about 5% holdouts.

Even the holdout is protected. Although the operator needs only a 75% signup in a drilling district, he is required by city law to impound for 5 years what would be the holdout's royalty share in the district's production. Anytime during that 5 years, the holdout property owned can execute a lease and the accrued royalties are handed over. The only thing he doesn't get is rental for his property for the time he was a holdout.

In the West Los Angeles - Culver City lease plays, another problem was met with some unique solutions. The area includes large Spanish and Japanese-speaking neighborhoods. In each case, Signal made extensive use of the foreign-language papers of both, as well as leasemen who spoke Spanish or Japanese.

Public relations . . . A large measure of Signal's success in town-lot leasing is attributed by the company to the close cooperation between the land department and the public-relations department.

While a lease play is being mapped out by the land department, the PR men map out an extensive publicity and advertising campaign to go with it. In general, the PR department follows these steps:

. . . News media. Metropolitan dailies radio, television, and neighborhood papers are supplied with frequent news releases on the progress of the leasing and Signal's future plans. Particular emphasis is placed on the neighborhood papers. In the West Los Angeles extension leasing, Signal used three Japanese-language papers, one Japanese-English paper, the city's leading Spanish-language paper, as well as all the neighborhood "throw-away" papers.

. . . Visuals. When the lease play is started, Signal sets up an office in the neighborhood and decorates it with photos of other successful town - lot drilling programs in the city. Emphasis in the photos is on dressed-up drill sites and landscaped wellhead locations.

. . . Advertising. Advertising campaigns are concentrated in the community papers where the lease play is going on.

watching WASHINGTON

Clyde La Motte

• Washington wheels are turning again . . .

A LIST of coming developments in Washington is beginning to lengthen, now that the holiday lull has ended and Congress is back in town.

Here are some of the prospects just around the corner for the oil industry:

. . . Import appeals. With the January 15 deadline for filing appeals past, the Oil Import Appeals Board now will begin arranging hearing times with the companies. Chief interest will be in standards the OIAB sets for determining which newcomers will be granted product quotas.

To become eligible for a new product quota, a company must show hardship, and it is up to the board to determine what constitutes a hardship.

It is quite likely that whatever definition the board comes up with, it will be challenged in court.

. . . U. S.-flag tankers. The Office of Civil and Defense Mobilization is expected to announce shortly whether it will hold a hearing on the request by the Committee for American Flag Tankers for a requirement that 50% of oil imports be hauled in U. S.-flag tankers.

If OCDM refuses to recommend such action to the President, independent tanker operators will press for congressional action.

. . . Marketing restrictions. Rep. James Roosevelt (D-Calif.) will soon circulate his proposals for legislation affecting marketing operations by major oil companies.

Roosevelt is likely to submit several proposals, as he has done in the past, ranging from broad marketing divorcement action to more limited legislation aimed principally at restricting major oil-company activity in the marketing of TBA items.

Roosevelt's subcommittee will get from its parent committee soon a decision on whether it should continue the hearings which it started in December. Tentatively, Roosevelt plans to call company men to Washington to testify on charges that they coerced service station owners into carrying a particular brand of TBA items.

. . . California offshore. The Interior Department is showing new interest in possible oil and gas development off California.

Interior hopes to meet with California officials this spring in an effort to work out an agreement under which deep-water exploration can be done without legal snarls over the state-federal boundary. Likely step: An escrow arrangement similar to that used off Louisiana to handle tracts claimed by both the state and federal government.

. . . Favored nation clauses. The Federal Power Commission is facing a tough decision on whether to declare all such contract clauses void. The issue is coming up in the Pure Oil Co. case, with oral arguments starting February 2.

The FPC doesn't like escalation clauses, but the alternative is not simple.

If FPC decides to rule out such clauses in all existing contracts, all these contracts would have to be renegotiated. Then the FPC would have to rule on whether the new rates were justified.

Obviously, this would add another staggering load to the already mountain-size backlog of work facing the commission. For the industry, this would simply mean more and more delay.

How the Steel Settlement Affects Oil

• There is little doubt the wage increases granted the steelworkers will be passed onto oil and other steel customers. The only questions are just when and how big will the increase be.

SETTLEMENT of the steel strike makes clearer the job ahead for oil-industry management: Cost must be cut even more drastically in the months ahead.

The victory of the steel union means oil will be clamped tighter in the now familiar cost-price squeeze. Consider these two sides of the press:

... Costs of everything the industry buys will be influenced by the expected prices for steel and the higher wages granted United Steel workers.

Everyone in the steel business is agreed higher steel prices are coming this year. Estimates vary on when and the amount.

Predictions on price range from a low of about $4.50 a ton more this year for basic steel to as much as $16 a ton higher over the 30-month life of the labor contract. Estimates on the time range from increases soon on specialty items or steel requiring extra processing to late in the year (after the elections) for any price increase in basic steel.

... Prices of crude, meanwhile, have eroded in spots within the last few weeks. They appear so far to be adjustments. But the average price of crude has dropped 15 cents per barrel over the last 2 years from a series of adjustments just such as these.

Costs climb . . . Oil expected to use the second highest tonnage of steel in its history to cover 1960 operations.

Steel sources estimate oil's 1960 needs at 5.9 million tons of oil-country tubular goods and line pipe. On the basis of a $4.50 price jump in basic steel the minimum added industry-wide cost this year would be $26½ million. The total cost would rise much higher when the extra cost is considered on such items as tanks, engines, compressors, meters, pumps, valves, refinery machinery, or processing equipment not included in oil-country tonnage statistics.

The steel industry shipped record tonnage to the oil country in 1957, when 6.49 million tons were used. The sharp drop to 3.4 million tons in 1958 reflected a depressed year for petroleum. The 1959 steel shipments and those expected in 1960 both reflected an upswing in oil economy.

Oil men know from experience the price increase in steel this year will be followed by others in 1961 and 1962. Steel companies advanced their basic prices $20.26 a ton in stages during the previous 3-year contract ending last July.

The total cost of the previous contract was estimated at 81 cents an hour. Estimates of the total cost of the new contract run from 39 to 41 cents an hour.

During that 1956-59 period, the price of crude showed a net average advance of only 17 cents per barrel. An average 2-cent per barrel advance was made in 1956 and a 30-cent increase in 1957. Declines of 8 cents in 1958 and 7 cents in 1959 shaved 15 cents off the gain, however.

There is nothing to indicate crude prices will fall any lower, but neither is there any strong indication that crude prices will recapture the 15-cent loss of the past 2 years. Thus, oil men face the impending increases in steel prices—which will lead to higher costs of producing and finding oil—without much hope of increasing crude prices.

What's ahead . . . The coming increases in steel prices probably will intensify trends already apparent.

They are forcing oil management to:

... Consider imported steel. Many domestic oil companies in the past have shied away from foreign steel. Imports of pipe and tubing into the U. S. for the first 9 months of 1959 totaled only 364,941 tons. Companies doing business abroad have bought from foreign suppliers. The cheaper foreign tubular goods will become much more attractive in this country if steel prices jump too sharply.

... Study substitute materials. Manufacturers of aluminum and plastic pipe now have more of a selling point to oil management.

... Economize on volume of steel. Companies already have told The Oil and Gas Journal privately they will strive to cut down on their need for steel by going to tubingless completions and slim-hole drilling and completions.

Steel Hikes vs. Crude Increases

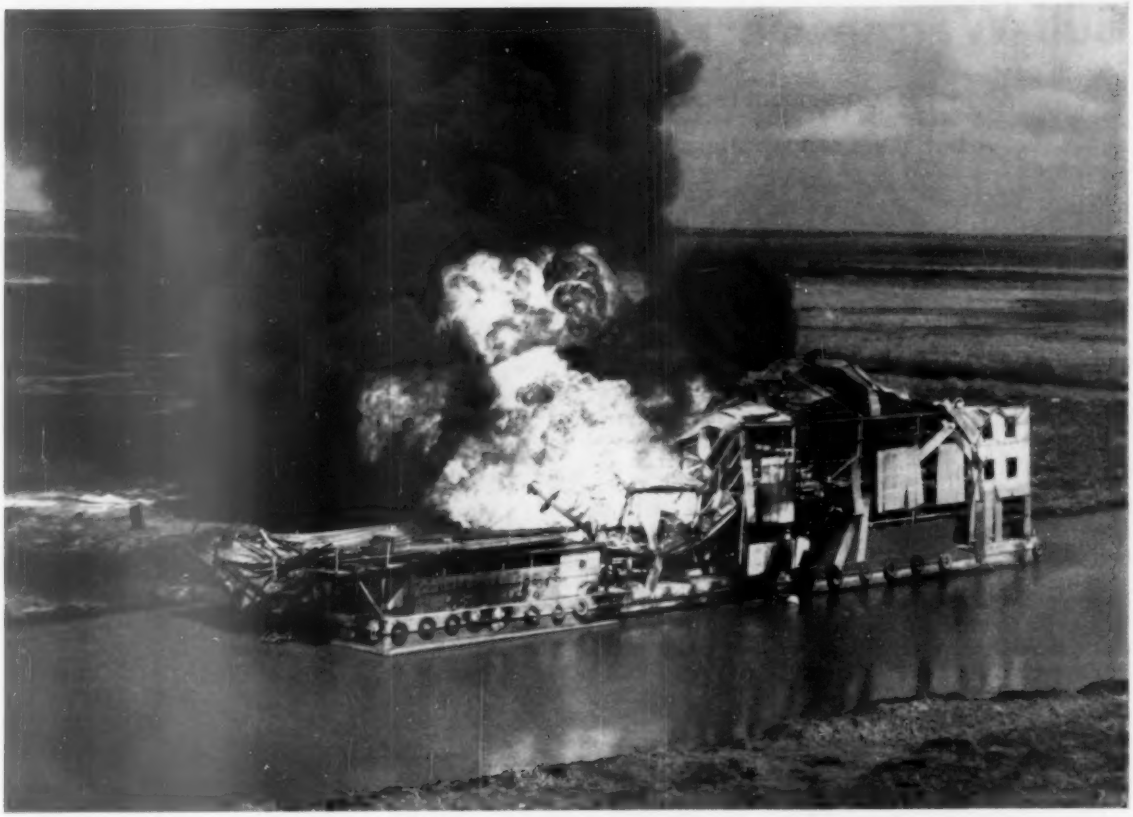
Year	Steel Wage Increase (cts./hr.)	Steel Price Increases ($/ton)	Crude Price Changes (cts./bbl.)
1950	19.4	5.88	+ 3
1951	...	...	— 2
1952	20.4	4.90	None
1953	12.1	5.16	+15
1954	8.6	3.26	+10
1955	18.9	7.54	— 1
1956	14.4	9.82	+ 2
1957	15.0	5.94	+30
1958	16.0	4.50	— 8
1959	...	...	— 7
Changes	**Up $1.248**	**Up $47.00**	**Up 40¢**

PIPELINE BRIEFS . . .

A $86,500,000 budget is planned this year by three subsidiaries of Pacific Lighting Corp. to expand natural-gas service in southern California. The breakdown will be Southern California Gas Co., $37,700,000; Southern Counties Gas Co., $23,400,000; and Pacific Lighting Gas Supply Co., $25,400,000.

A 300-mile gas-pipeline system is planned by Oklahoma Resources Development Co., Oklahoma City, headed by E. C. Joullian, president, to serve power plants in the vicnity of Oklahoma City and Muskogee. The main line, some 170 miles of 12-in., will run from Oklahoma City to Harrah and Muskogee, to plants of Oklahoma Gas & Electric Co. Capacity will be 50,000,000 cu. ft. daily.

The rest of the system will be 4 to 10-in., including supply laterals from near Okeene in Blaine County, northwestern Logan County, and the Greasy Creek area of Hughes County. Oklahoma Resources, which now serves O G & E plants at Oklahoma City and Sulphur, plans to assume service to the Harrah and Muskogee plants now connected by Oklahoma Natural Gas Co.



Wild Well Takes Its Toll — One Mobile Drilling Barge

A high-pressure South Louisiana well, completed as an oil and gas dual producer, blew out last week and caught fire.

The spectacular blaze occurred in Deer Island field 18 miles south and slightly west of Morgan City. It destroyed the Belle Claire mobile barge and all equipment. (The derrick toppled to one side and is hidden by the heavy smoke in the photo above).

Union Producing Co. was the operator and Continental Shell Drilling Co. the driller on a lease held by Continental Land & Fur Co. The blowout came just after workmen had made the dual completion and the rig was ready for release. Tubing collapsed below the christmas tree. The escaping gas ignited apparently from a nearby flare.

Fire Fighter Red Adair, Houston, was called in to bring the well under control. Preparations were made to cut away the remains of the 45 by 170-ft. barge and possibly to drill a relief well.

The well had been completed as an oil producer at 12,100 ft. and a gas producer at 11,912 ft. Pressure of 6,800 psi. was recorded in initial tests, and oil flowed at a rate of 316 bbl. daily from a one-eighth in. choke.

A 34-mile 12-in. crude line is planned by Magnolia Pipe Line Co. in Cameron Parish, Louisiana. Bids are due in from contractors this week.

Hearings will begin February 1 before the FPC on a project to boost gas deliveries to California 550,000,000 cu. ft. daily. Involved are El Paso Natural Gas Co., its subsidiary, Pacific Northwest Pipeline Corp., and Colorado Interstate Gas Co. Gas supply will come from Canada, the Rocky Mountains, and the Panhandle-Hugoton area of Oklahoma and Texas. CIG will build new facilities from the Texas Panhandle to Denver, and from Green River, Wyo., to Provo, Utah, where gas will be delivered into a line which El Paso will build to the California border.

A $44,876,000 expansion including 341 miles of 24-in. and 188 miles of 30-in. loops is planned by Michigan Wisconsin Pipe Line Co. The company seeks FPC authority for the loops and 6,000 hp. in compression to take 100,000,000 cu. ft. daily from Harper County fields in northwestern Oklahoma, starting September 1. Michigan Wisconsin, in a separate project, proposes to spend $4,363,000 for looping to provide capacity for 75,000 M.c.f. which Northern Natural would deliver at Janesville, Wis.

Also for Pipeliners . . .

IN THE NEWS: There is little doubt steel wage increases will be passed on to oil and other customers (p. 50) . . . Pipe shortage is slowing down Russian pipeline projects (p. 62).

PLUS THESE TECHNICAL REPORTS: Swampy country and city congestion combated on 36-in. line (p. 51) . . . Lube-oil tests reveal wear in pipeline compressor engines (p. 104).

Gulf-Warren Decree Sets No Merger Policy

• FTC agreement requires sale of $50 million or more of Warren's properties, but there's no pattern to indicate exactly what the FTC was driving at.

THE CONSENT decree in Gulf Oil Corp.'s acquisition of Warren Petroleum Corp. is not likely to become a reference work on the application of antitrust rules to mergers.

It appears to be more of a compromise between Gulf and the Federal Trade Commission in which both gave ground to get the case settled after nearly 4 years of dispute.

As a result, Gulf will be required to dispose of about a fifth of Warren's properties.

Furthermore, it faces certain specific marketing restrictions, particularly at the retail level.

Properties which must be sold include retail marketing, wholesale marketing, and terminal facilities, a petrochemical plant, tank cars, some gas-liquids recovery plants, and other interests.

At the same time, Gulf is privileged to expand in any of these fields, to build new facilities, or even to lease back the tank cars it sells.

FTC's announced objective was to prevent Gulf from being in a position to further lessen competition in the sale of liquefied petroleum gas and natural gasoline. What is settled for, in effect, were some safeguards to protect the smaller independent operators whom the FTC felt were endangered by the merger.

The ruling . . . For the next 10 years Gulf and Warren must make available to the various classes of independent purchasers the same percentages of LPG and natural gasoline which the two companies sold to these independents in 1955.

And, for the same period, they are forbidden to acquire stock control of more than 20% of the assets of any marketer of LPG or natural gasoline if the marketer's annual domestic sales of the two products combined exceeds 125,000,000 gals.

As a further protection to the smaller marketers, the order stipulates that Gulf, in its required divestiture of certain Warren holdings, can not sell to 23 major companies dealing in natural gas liquids.

Nor can any sale of the properties be conditioned on the purchaser dealing with either Gulf or Warren or their subsidiaries.

Properties involved . . . The FTC's emphasis on the distributor and retail level is shown in the listing of Warren properties which Gulf must sell. These include the following:

All ownership Warren currently has in three Little Rock, Ark., companies: Butane Gas, Inc.; Butane Wholesale Gas Co.; and Harris Distributors, Inc.

All properties of the Dri-Gas Division of Warren, together with its list of customers and Warren's right to use the brand name "Dri-Gas."

All railroad tank cars suitable for transporting LPG or natural gasoline which Warren either owned or had the right to use as of March 2, 1956.

All of Warren's ownership (as of March 2, 1956) in these gas-liquids plants: Madill Plant, Madill, Okla.; Ringwood Plant, Ringwood, Okla.; and Midland Gasoline Plant, Conroe.

Warren's petrochemical plant near Conroe.

All natural-gasoline storage facilities, loading and unloading equipment, pumps, tanks, and pipe at San Pedro, Calif.

Sales picture . . . In its efforts to keep the competitive picture the same as it was before Gulf acquired Warren, the FTC specified the following sale percentages which Gulf and Warren must make—or try to make:

In LPG sales, 48.64% must be made to independent wholesalers, distributors and jobbers, and retailers; 2.58% to independent nonmajor refiners; and 3.52% to independent nonintegrated petrochamical manufacturers.

In natural-gasoline sales, 44.8% must be made to independent nonmajor refineries.

Gulf had acquired Warren in March of 1956. In December of that year the FTC issued a complaint charging that Gulf's acquisition violated the antimerger law because "it endangered competition and tended to create a monopoly in the production and sale of LPG and natural gasoline."

Canada to Increase Far North Activity

• Russians tell Calgary symposium they are ahead of U. S. and Canada in searching for oil in the Arctic.

THE CANADIAN Government plans to double the pace of its geological survey of the Canadian Far North within the next 5 years.

The stepup was discovered last week in Calgary by Alvin Hamilton, Minister of Northern Affairs and Natural Resources, at the first international symposium ever held on Arctic geology.

More than 1,000 delegates from all over the world attended the conference, sponsored by the Alberta Society of Petroleum Geologists. The delegates were from the U. S., Chile, Denmark, England, Finland, France, Holland, Germany, Iceland, Norway, Sweden, and Russia.

Hamilton said the symposium pointed up the faith that oil-development plans in the Far North are realistic, and that private enterprise as well as governments share that faith.

"I am of the firm opinion, as I was more than 2 months ago, that there will be low-cost oil in the Arctic," Hamilton said.

What Reds are doing . . . A Russian geological exhibit at the symposium has been widely praised as "the most complete exhibit on show."

William M. Jubb, business manager of the Alberta Society of Petroleum Geologists, said the Russians "have obviously done more work in their region than either the U. S. or Canada.

"In their charts the Russians have the various geological periods broken down into smaller units, with closer age-ranges than Canada or the U. S. It can therefore be said they are much further advanced in their geological interpretations."

Russian charts covered the structure formations of the Soviet Arctic from the Precambrian age to the Quaternary age. The charts give mineral descriptions of the formations

and the prehistoric animal life that decides the age of the geological units.

The Russians, Jubb said, have 2,000 geologists working in their Arctic. "We have six working on a Canadian Government survey." Geologists in the North for private enterprise concerns would boost the total to a maximum of 100.

Dr. F. G. Markov, head of a three-man Russian delegation, seemed surprised that Canada is just now drilling her first oil well in the Arctic Circle —at Grandview on the Mackenzie river.

Dr. Markov, editor of the Russian magazine, "Geology of the Soviet Arctic," added: "I cannot say how many we have, as that's not my field, but we have quite a number."

He described the Arctic symposium as "an excellent thing for geological understanding. This symposium is the sort of thing that must be encouraged and is the start of general cooperation in our field. Geologists cannot work by themselves and we have frequently used Canadian research done in your part of the Arctic."

Dr. W. C. Gussow, president of the Alberta Society, said the most logical area for Eurasian-American cooperation lies in the Arctic.

A special speaker at the symposium was Comdr. James F. Calvert of the U. S. Navy who captained the historic voyage of the nuclear-powered American submarine "Skate" under the Arctic ice in August 1958 and again in March 1959.

Although the submarines could be extremely valuable in military operations, Comdr. Calvert felt there would be no civilian applications of the craft within the next 20 years.

"I doubt the submarine could achieve commercial significance in the next 20 years, but I could not say beyond that. Everything connected with submarines is still dreadfully expensive," he said.

He added that he thought there "is tremendous economic and industrial potential in the Arctic."

Shell Enters Liquid-Methane Field

ROYAL Dutch-Shell is joining Continental Oil Co. and Union Stockyard & Transit Co. to develop a world-wide liquefied natural gas industry.

The three companies have formed Conch International Methane Co., Ltd.,

Shell and Continental hold 40% each and Union Stockyard 20% in the new firm.

The companies said Shell's world-wide operations, coupled with Continental and Union Stockyards' technical knowledge "should accelerate the development of commercial transportation of methane in liquid form from producing countries to distant markets in industrial areas of the world."

Shell's interest in the new company will be held by Canadian Shell, Ltd., a holding company which owns Shell de Venezuela, Shell Caribbean, and Canadian Shell Explorations, Ltd.

The first successful effort to move liquid methane by ship occurred last February when the Methane Pioneer, an experimental tanker, moved a cargo from Lake Charles, La., to the United Kingdom.

It was a joint project of Constock International Methane, Ltd., and the British Gas Council. Since then, several 2,000-ton cargoes have moved to the North Thames Gas Board's special depot on Canvey Island, Essex.

Appeals Court Upholds Small-Tract Well

DEVELOPMENTS came in rapid-fire order last week in Texas' legal war over small-tract drilling.

The Fourth Court of Civil Appeals in Austin made final its decision upholding an exception to the Normanna gas field spacing rules which permitted Bright & Schiff, Dallas operator, to drill a well on a 79 by 130 ft. town lot in Bee County.

The court overruled a motion filed by Atlantic Refining Co. for a rehearing of the case.

Atlantic charged that the cost of drilling the well far exceeded the value of the minerals in place under the tiny Bright & Schiff lease and that the well would drain a huge volume of gas from under adjoining Atlantic leases.

Atlantic has a companion case pending in the Texas Supreme Court which attacks the allocation formula for Normanna. This formula distributes field allowable to the operators on a two-thirds acreage, one-third well basis. Atlantic contends this will permit the Bright & Schiff well to recover far more than its proportionate share of the field's reserves.

On another front, in a suit involving small-tract drilling in Port Acres field on the Texas Gulf Coast in Jefferson County, the court has advanced the date for hearing from March 9 to January 20.

In this one, Michel T. Halbouty is asking the court to revoke a permit issued by the Railroad Commission to W. G. Darsey, Jr., to drill a well on a ½-acre tract.

All told, 29 suits have been filed against Darsey and other owners of small tracts in the field by major operators in the field.

Pure Reorganizes Division Offices

PURE OIL CO. is reorganizing its exploration and production operations.

The company will expand offices in Houston and Denver, close division offices in Tulsa and Fort Worth, and reduce its eastern division setup at Olney, Ill., to district status. Two division offices, instead of the present five, will handle all domestic operations. (See personals section for personnel changes).

As of July 1, the Tulsa and Olney division offices will be closed and these operations consolidated in a new northern production division in Denver. A district staff will direct field work out of Olney.

A new southern production division at Houston combines the Houston and Fort Worth division offices. The Fort Worth office will be closed September 1.

There are 115 employes in each of the Tulsa and Forth Worth offices and 80 at Olney. The company says it plans to "afford employes every opportunity to transfer" to the new operating areas.

Pure and its predecessor company have maintained division offices in Tulsa more than 40 years and have been in their own building there since 1924.

The company says the moves are planned to increase effectiveness of its exploration and production effort.

U. S. Plant First to Use Italian Process

- Transwestern ready with its gas-treating plant at Fort Stockton, Tex.

THE FIRST plant for the U. S. natural-gas industry using the Giammarco-Vetrocoke process for acid gas removal is ready for operation by Transwestern Pipeline Co. near Fort Stockton, Tex.

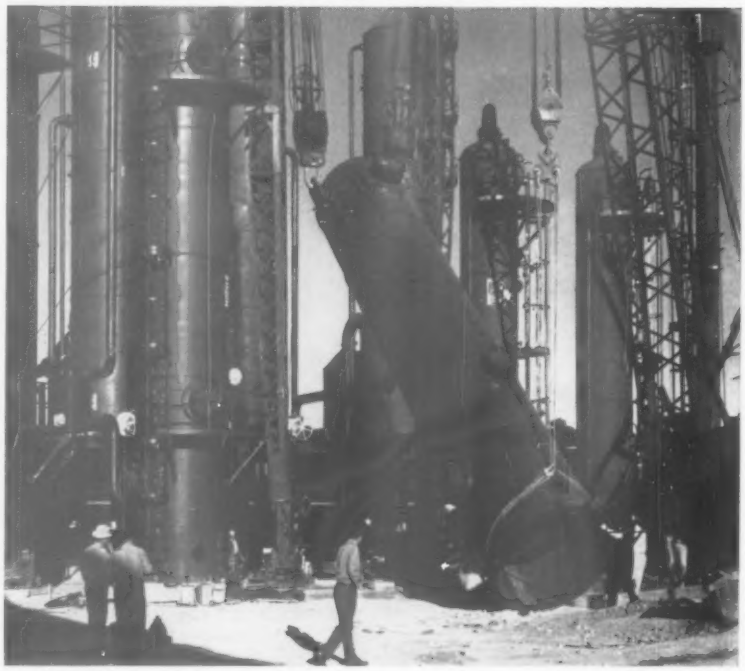
Actual plant start-up will be timed to match completion of Transwestern's pipeline from Texas to California (OGJ, Oct. 26, p. 56). The plant was constructed by Brown & Root, Inc.

The plant will treat 180,000 M.c.f. of natural gas daily. The gas contains 28% carbon dioxide and up to 0.2% hydrogen sulfide and enters the plant at 1,050 psi. The treated gas will be essentially free of hydrogen sulfide and contain less than 2% carbon dioxide.

This is the first plant to use power-recovery pumps in sizes of over 1,000 hp. each. These pumps use energy that would ordinarily be wasted in lowering the absorbing solution pressure down to the stripper pressure.

More than half the plant's power requirements is obtained from three power-recovery pumps between the absorbers and strippers. The rest of the power needs are met by using less than 4,000 M.c.f. of sour gas daily to develop 1,800 kw. of electrical energy and 120,000 lb. per hour of steam.

Brown & Root says that the Italian process can lower plant costs to less than half of a conventional amine unit. Power requirements are less than one-eighth of the amine process. The savings result from a different absorbing solution and improved equipment design.



UP GOES another carbon-dioxide absorber, weighing 91 tons, at Transwestern's gas-treating plant near Fort Stockton, Tex.

INDUSTRY BRIEFS . . .

Cities Service Co. has elected to exercise an option to buy stock owned by public minority shareowners of Arkansas Fuel Oil Corp. at $40 a share. The offer is subject to certain conditions and favorable rulings from Internal Revenue Service. Cities Service owns 51½% of Arkansas Fuel and is under order of the Securities and Exchange Commission to buy out the minority or liquidate its majority holdings.

Gulf Oil Corp. has pulled out of Cuba in the wake of harrassing moves by Premier Fidel Castro's revolutionary government. Gulf spent $7 million on geological, geophysical, and drilling operations in Cuba in 14 years only to have its concession rights nullified by recent Petroleum Law No. 635.

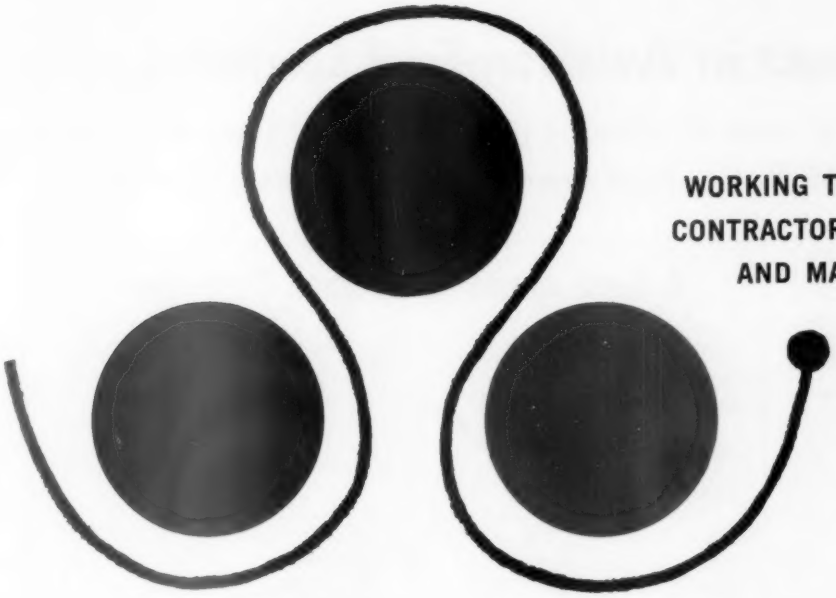
Negotiations are under way for the sale of the Joe W. Brown oil properties in Louisiana, and an announcement can be expected in the next week or two. The sale is expected to be in the $40 million to $50 million class. The estate of the late Joe W. Brown includes producing properties in the Valentine field of Lafourche Parish. Among the companies bidding on the properties is General American Oil Co., Dallas.

Arkansas Louisiana Gas Co., Shreveport, proposed to absorb Consolidated Gas Utilities Corp., Oklahoma City. A merger proposal has been approved by directors of the two companies and will be submitted to stockholders for approval. Under the proposal, Consolidated stockholders would receive for each share of stock one share of a new class of cumulative convertible preferred stock of Arkansas Louisiana.

The Texas Railroad Commission last week gave Humble the green light to hike gas cycling in Tijerina-Canales-Blucher, Borregos, Seeligson, and Stratton fields in South Texas to a total volume of 350,000,000 cu. ft. a day. The old top limit was 300,000,000 cu. ft. daily. The higher limit, Humble said, was necessary for flexibility in day-to-day operations of its huge new Seeligson gas plant.

Shell Oil Co. of Canada obtained majority control of North Star Oil with a bid of $19 for class A shares and $34.25 for common shares from the estate of the late F. C. Manning of Halifax.

The $37,000,000 acquisition included two refineries, production and exploration facilities in Alberta and Saskatchewan, and marketing operations serving northern British Columbia, the Northwest Territories, Northwest Ontario, and the prairie provinces.



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High drilling costs can be cut by efficient use of drilling fluids. The right drilling chemicals, **used right** by Magcobar engineers, can help increase penetration rates, save on trips and bits, reduce materials needed, and save on equipment and manpower.

But, to make sure that the mud program is the most efficient, it must be planned from the beginning. And, because it must deal with so many specifics, it can be developed only with the close cooperation of producer, contractor, and Magcobar engineer. A sound mud program must be based on product performance, formations to be drilled and, very important, type of equipment to be used.

By working together, a planned mud program can be developed to make full use of the money-saving advantages of Magcobar Technology. This Technology formulates special drilling fluids to reduce or prevent damage to the pay, resulting in quicker completion, higher production, and less need for expensive stimulation work. Magcobar Technology can help you as a contractor to drill wells more cheaply, can help you as a producer to have better wells. Drill your next wells with Planned Mud Programs with Magcobar.

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What to Expect in Aviation-Fuel Demand

● Free-world use to top million-barrel-daily mark in 2 years, Mobil Oil expert tells SAE. U. S. demand placed at 700,000 bbl. daily by 1965.

FREE-WORLD jet-fuel and avgas requirements will reach the 1,000,000-bbl.-daily mark by 1962, and the U. S. still will be the world's No. 1 market.

Those are predictions of W. S. Mount, aviation department, Mobil Oil Co., in a paper before the annual meeting in Detroit last week of the Society of Automotive Engineers.

Of the million-barrel total in 2 years, Mount figures about 70% will be jet fuel and about 30% avgas.

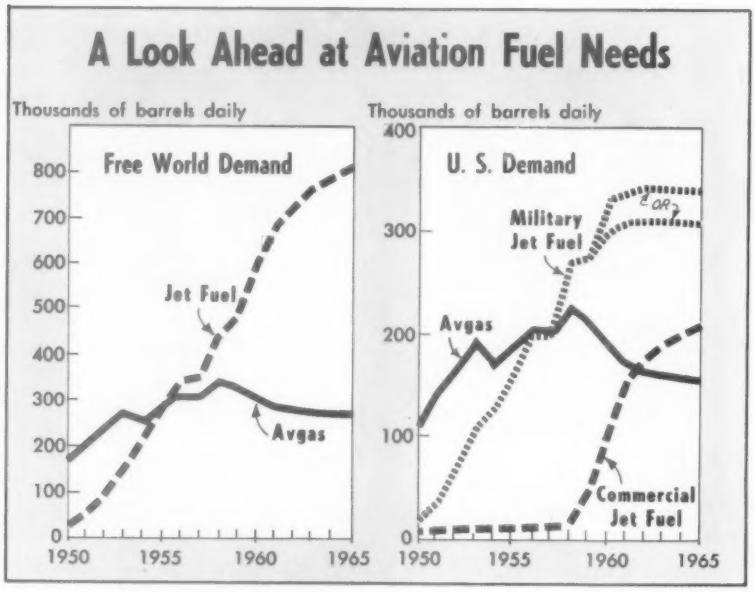
He places U. S. demand at more than 700,000 bbl. daily by 1965. Avgas demand by then will be down to about 160,000 bbl. per day, but commercial jet demand will be up to 220,000 bbl. and military demand to 310,000 to 350,000 bbl.

Mount sees two other developments likely to occur as demand rises:

. . . **Standard fuel** will grow less common as individual airlines call for fuels with characteristics suited to their particular operations.

. . . **Wide-cut fuels** may become more popular among airlines because of their greater availability and improved energy per pound of weight.

Mount says the rise in demand, lack of standardization, and the possible swing to wide-cut fuels will not pose any impossible burdens for refiners.



Commercial jet fuels . . . There are at least four airline jet fuels in this country today. The four commercial fuels fall within the general framework of ASTM Types A, A-1, and B fuels, but they differ significantly in certain properties. These differences stem from the fact that the exacting needs of some jet operations lead to fuels tailored to the need of the particular airline.

The first airline to use jet fuel in the U. S. specified wide-cut fuel, originally called JP-4 but now ASTM Type B. This line plans to continue its use, Mount reports, adding that this fuel is finding a place in the plans of other airlines.

Experience indicates, he says, that changeover from kerosine to wide-cut fuel from one airport to another, without engine adjustment, is feasible. This possibility of changing from one fuel to another is of interest because of the changing refinery economics from one area to another on a long international airline route.

The wide-cut type of fuel appears to have greater possibilities abroad than in the U. S. Outside the U. S., middle of the barrel demands are disproportionately high and gasoline needs are low. The sale of the wide-cut fuel is therefore an aid to balance in fuel refining and there is a greater availability of wide-cut fuel overseas.

Wide-cut Type B fuels are similar to military JP-4 and, like the military product, can readily be manufactured in a great many refineries close to large airports. In addition to its economic availability, this product uses a high proportion of low-octane gasoline fractions. This makes it attractive as a product for manufacture in overseas refineries where motor-gasoline octane capability is sometimes a problem.

Wide-cut fuel, Mount adds, has improved energy per pound of weight. The result may be a greater payload over medium to long-range operations. This fuel also has the potential for considerable combustion quality development. This feature, he says, is getting more attention as the airlines consider their plans for the future.

Kerosine-type fuels, as compared to the traditional ground uses for this fuel, warrant a small price premium today, Mount contends. He believes it will be needed in the future as an incentive to further quality development.

Grace Offers to Buy Control of Cosden

W. R. GRACE & CO., best known for its banking and shipping interests, may expand its oil operations.

It is offering to buy up 1,580,000 shares of the outstanding stock of Cosden Petroleum Co. at $25 per share. Cosden stock closed at 23⅞ the day Grace's offer became public.

Grace admitted that the step could "eventually" lead to a merger but denied any such plans at present.

Its request for tenders expires February 11, or earlier if tenders for the maximum number of shares has been received. It would give Grace more than half of Cosden's 2,748,000 outstanding shares.

Grace is already producing petrochemicals, and a union with Cosden could lead to an expansion of its activities in this field. The company is also interested in Libyan American Oil Co., which has found oil in Libya, and its Davison Chemical division is a major producer of refinery catalysts.

Crude Prices Change—Both Up and Down

PRICE changes on crude oil continued last week.

Sinclair Crude Oil Co. reduced the price of Southeast Texas crude 15 cents a barrel. Suntide Refining Co. made a 10-cent cut on crude in Victoria County on the Gulf Coast. Union Oil Co. raised its Four Corners postings by 23 cents. Pennsylvania-grade crude was priced 15 cents higher.

Sinclair's cut involved about 20,000 bbl. daily of crude in Silsbee, Village Mills, Arcola, Arriola, Beech Creek, Blackhome, Elliott, Fred East, Hampton South, Hull, Jackson Doty, Joes Lake, and Karlgore fields in Southeast Texas, north of Beaumont.

The new posting reduced the crude from a top of $3.35 to $3.20 per bbl., the same price paid for Southwest Texas and Gulf Coast light crudes. It's the second price cut on Southeast Texas crude since the 1957 general price increase and still leaves the area price 10 cents a barrel higher than 3 years ago.

Suntide's 10-cent cut covered about 4,000 bbl. daily it buys in Victoria County fields on the Texas Gulf Coast. It met a similar cut on 3,500 bbl. daily in the region posted a week before by Republic Oil Refining Co. New top is $3.25 a barrel with a 2-cent per degree gravity differential.

Union's action in the Four Corners restored part of a 30-cent cut made last September. The new top of $2.75 a barrel matches the price posted by Shell Oil Co. last fall.

The 15-cent increase for Pennsylvania-grade crude was posted by Joseph Seep Purchasing Agency of South Penn Oil Co. Its new quotations: Bradford district oil in Bradford Transit Co., $4.55; Bradford district oil in National Transit Co., $4.55; Middle district-grade oil in National Transit $4.37; Pennsylvania-grade oil in National Transit (Southwest Division) $4.10; Pennsylvania-grade oil in Eureka Pipe Line Co., $3.92.

No change was made for Corning crude. The agency does not post for Allegheny, Buckeye, or Zanesville Pennsylvania grades.

The South Penn announcement explained the increased prices stemmed from continued good demand for Pennsylvania-grade crude. The price increases were intended as incentives for producers who are faced with increased costs.

In Canada, meanwhile, Gibson Petroleum Co. posted a 1-cent per barrel increase in the price it will pay for crudes from two fields near Edmonton. New tops are $2.29 for Big Lake South crude and $2.32 for St. Albert crude.

Lease Sales to open Alaskan Areas

TWO oil and gas lease sales in Alaska are planned for the first quarter of this year. Acreage involved lies in the Gubik gas field and in offshore waters.

A sealed-bid lease sale for 9,000 acres contained in 16 separate blocks in Gubik within Naval Petroleum Reserve No. 4 has been set for February 24 by the Bureau of Land Management, Fairbanks.

The land was released for leasing in 1959 when oil companies indicated it was needed to develop Gubik gas field properly. Colorado Oil & Gas Corp., major lease holder in the part of Gubik previously released, plans to develop the field and build a pipeline to Fairbanks when the new leases become available and market contracts are completed.

Nominations, meanwhile, are being taken now for tracts to be offered in the second state sale of offshore leases.

Director Roscoe E. Bell of the Alaska Division of Lands identified areas for which nominations are being accepted as the Port Heiden, Port Moller, and Nushagak peninsula areas of Bristol bay off Kodiak island; the Gulf of Alaska; and new parts of Cook Inlet and Sheilikof strait.

Bell reported the state plans the sale for the first part of the year.

PROCESSING BRIEFS . . .

Pan American and Hondo Oil & Gas have started construction on their Empire Abo gasoline plant 13 miles southeast of Artesia. The new plant, going up on a 20-acre site in Empire Abo field, is slated for completion about June 1. It will have an initial capacity of 15,000,000 cu. ft. a day and will recover about 42,000 gal. of LPG. Also incorporated in the plant is a sulfur-recovery unit designed by Pan American. Prime contractor will be O. L. Olsen Co., Inc., Houston.

Gulf Oil Corp. will begin production of high-purity cyclohexane next month from a recently completed plant at its Port Arthur, Tex., refinery.

An expansion from 100,000,000 to 200,000,000 cu. ft. daily is getting under way at the Spearman, Tex., gasoline plant in Ochiltree County of Northern Natural Gas Co. Dresser Engineering Co., Tulsa, has the contract. The project is to be completed by July 1, 1960.

Oronite Chemical Co., a subsidiary of Standard Oil Co. of California, is building a 20 million pound-per-year maleic anhydride plant at Standard's Richmond, Calif., refinery.

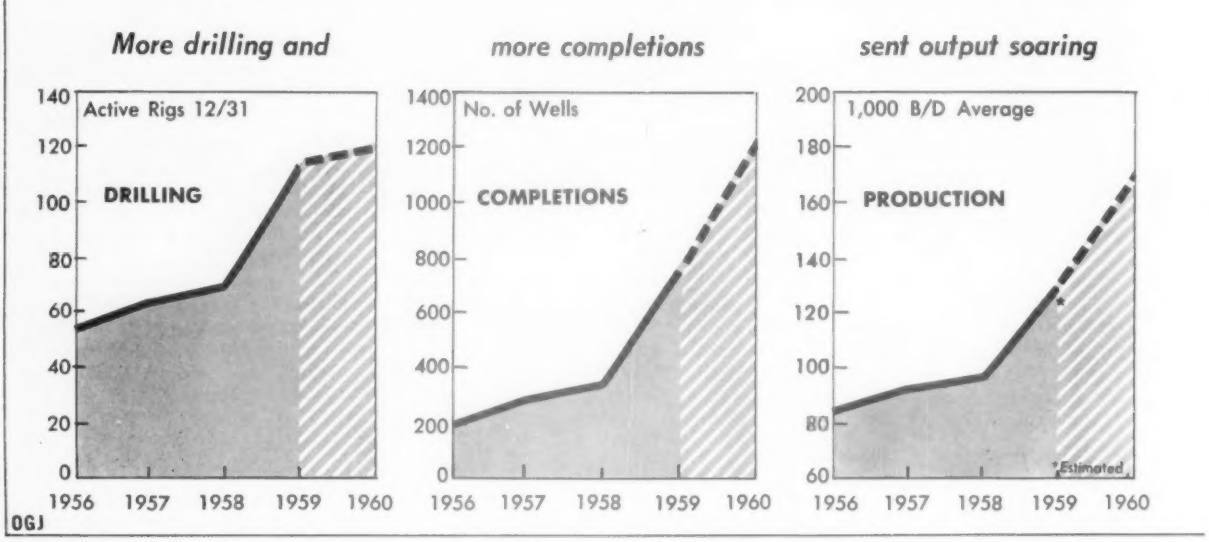
The Henry H. Cross Co. and Henry H. Cross Co. of Arkansas have been purchased by Harry P. Dunn Co., Charles J. Wood & Associates, Inc., and National Wax Co. Cross company offices will remain in Chicago, Colmar, Ill., and Smackover, Ark. The companies operate two small refineries in Smackover and Colmar. Charles J. Wood is president of the Cross companies, replacing George F. Fox (see personals).

Also for Refiners . . .

IN THE NEWS: Cities Service, Richfield, Imperial, and Royalite join forces in Athabasca project (p. 44) . . . Amoco retains control over work practices in Texas City settlement with OCAW (p. 47) . . . Transwestern's plant at Fort Stockton, Tex., is first U. S. plant to use the Giammarco-Vetrocoke process for acid gas removal (p. 54) . . . Free-world jet-fuel and avgas needs will reach 1,000,000-bbl.-daily mark by 1962 (p. 56) . . . Crude prices continue change (p. 57).

PLUS THESE TECHNICAL REPORTS: Special report on estimating heat exchangers (p. 67) . . . Distillation plant produces fresh water at low cost (p. 93).

1959 Set a New Pattern for Future Oil Activity



1960 Is a Critical Year for Argentina's

• President Frondizi's new policy of permitting foreigners to do development work will stand or fall this year. Right now, it's a good bet that the program will reach its goal of making the country self-sufficient in oil.

ARGENTINA has turned the corner in its 50-year-old climb to produce enough oil to satisfy its own needs.

This year is the key to winning the fight. If no political troubles rock the boat and the Argentine oil industry continues to expand at its present rate, the country should be self-sufficient in oil by 1964 or sooner.

Yacimientos Petroliferos Fiscales, the government oil agency, has already begun twisting the tourniquet to halt the flow of costly oil imports into the country. By the end of this year, with the help of foreign companies and contractors working for YPF, the flow should be slowed to a trickle.

This will not only solve the basic problems of the Argentine oil industry, but it will go a long way toward curing the basic economic anemia that has long weakened Argentine industrial progress.

Foreign exchange to pay for oil to keep the country developing has long bled Argentina white. At the same time, YPF and its own oil industry has been pretty well shackled by a lack of development capital. It was the same money in each case. As long as Argentina had to pay for oil imports, it had no money to develop domestic sources to supplant the imports.

Compounding this ailment has always been the extremely high fever (higher than in most Latin American countries) of nationalism that suspiciously opposed any idea of experienced, financially-backed foreign companies having any part in Argentine oil.

This was the attitude that finally toppled the dictator Juan Peron from power. He tried to buck the national feeling and open the country to foreign developers after years of oil as a national monopoly. President Arturo Frondizi faced the same problem when he took over the reins of Argentina's Government after Peron fled.

There was one major difference. Informed Argentine businessmen and professionals had by this time recognized the economic fact that a lack of oil was stifling the country. In addition, the army and navy are now directed by a corps of officers who recognized their country's economic pitfalls and supported the democratic regime. They have so far held down any uprising that could topple the structure of the constitutional government.

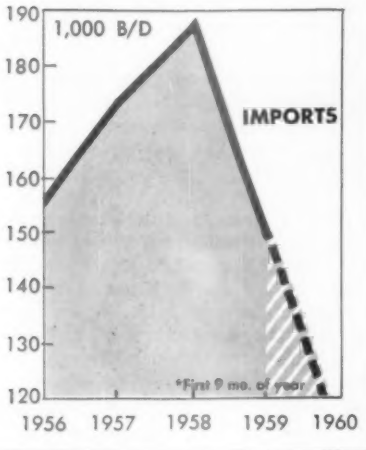
It was in this delicate but encouraging political climate that the Frondizi regime made a courageous move. Frondizi pushed through new oil legislation that allowed YPF to make development contracts with foreign firms.

It was a diplomatic coup. There are no concessions as such. No foreign company can lay claim to Argentine oil. The pride of the Argentine in his "the oil is ours" slogan was safe. The foreign companies and contractors will be paid for their work in oil or in a portion of the value of the oil, depending on individual contracts.

As a result, contracts for exploration and development were signed with Pan American Argentina Oil Co.; Union Oil Co. of California; L. R. Development, Ltd., which is headed by the New York banking firm Carl M. Loeb Rhoades; Esso Argentina,

in Argentina

and imports diving.



Oil Program

Inc., Shell Production Co.; and Tennessee Argentina, S.A., a subsidiary of Tennessee Gas Transmission Co.

A different type of contract for services and drilling was signed with Laughlin-Porter Drilling Co., Southeastern Drilling Corp., Kerr-McGee Oil Industries, Inc., ASTRA, Halliburton, Lane Wells, Schlumberger and SAIPEN, an affiliate of Italy's government-owned Enre Nazionale Idrocarburi.

What has happened . . . These new contracts have given the Argentine oil industry a concerted boost that would have taken years to match by strictly internal expansion.

Little of the spurt of drilling activity under these contracts is reflected in the steady climb of Argentina's daily average production and the resulting drop in imports (see charts). These upward curves are almost entirely due to the steady expansion of YPF itself. The sharp jumps that will come in 1960, 1961, and later years will reflect the new contracts.

The real burden of seeing that the oil made available by the increased drilling can be used in Argentina still lies with YPF. Pipelines and other transportation facilities could still be a bottleneck. The means to move Argentine oil from remote fields to the consumption centers on the coast will be expensive.

Argentina's new Frondizi oil policy weathered its first severe political storm 7 months ago and emerged from a cabinet shakeup with renewed strength.

At that time President Frondizi appointed Alvaro Alsogaray, a 47-year-old army engineer and champion of free enterprise, as economics minister —the post which controls YPF and the oil industry.

In the internal struggle which preceded the Alsogaray appointment, Frondizi's cabinet and the top echelon of YPF resigned.

One of Alsogarary's first actions was to reinstate Horacio Aguierre Legarreta as president of YPF's board of directors, thus mending any breach in the organization.

Alsogaray has devoted his efforts, so far successfully, to finding the money YPF must have to finance its costly expansion projects and pipeline construction.

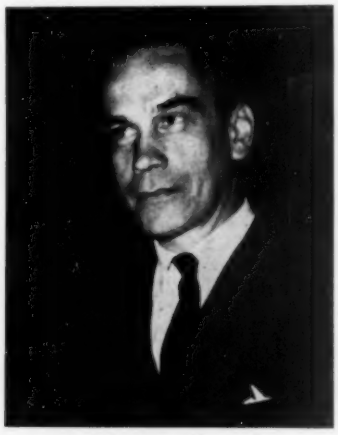
He returned to Buenos Aires late last year from a selling job in Europe during which he reportedly got commitments from banking houses for short-term credits of from $70 to $80 million to bolster the program. Negotiations are in the final stages for $100 million from the International Monetary Fund.

Alsogaray hopes that private banks in both the U. S. and Europe will extend Argentina between $150 and $160 million in credits to finance the

The men behind Argentina's oil program

President Arturo Frondizi
. . . architect of the program to make Argentina self-sufficient in oil.

Economics Minister Alsogaray
. . . his job is to find the money to finance the expansion plans.



YPF President Aguierre
. . . he's handling YPF's program and the deals with foreign firms.

NEW PIPELINES are a key part of Argentina's plan to cut imports and live on domestic oil. Native welders are shown working on the line from the Salta field to San Lorenzo.

country's expansion. Much of this is earmarked for oil projects.

Drilling . . . The straight drilling contracts which YPF has so far concluded call for an ambitious 1,800 development wells in fields of the Comodoro Rivadavia area within the next 4 years. As 1960 gets under way there is every indication that YPF would like to extend all these contracts and it is very possible that this will happen.

Southeastern Drilling Co. has the largest contract, which calls for 1,000 wells for which it will be paid more than $50 million (OGJ, January 4, p. 61).

The second big contract is with Kerr-McGee and calls for drilling 500 wells in the Comodoro Rivadavia region within 3 years. SAIPEN, an affiliate of Italy's ENI, will drill 300 development wells in the same period.

The other development contracts with companies are on a slightly different basis. In each case the oil company has been given a specified area in which to work rather than a set number of wells to be drilled. Each will be compensated on the basis of the oil it develops.

Here are the regions and acreages involved:

. . . Esso has a 30-year contract to develop a 1,180,000-acre area in Neuquen in the same region where the company has been operating for more than 30 years.

. . . L. R. Development has two regions, one in Mendoza province includes the structures of La Ventana, Punta Bardas, and Vacas Muertas. The second is an area of more than 1,900 sq. miles in Santa Cruz.

. . . Pan American has a contract to develop a 1,500-sq.-mile block in the Comodoro Rivadavia region. The contract calls for the company to spend $60 million over 15 years with the provision that at least 50 wells must be drilled the first year. More than 50 wells have already been completed.

. . . Shell took on a contract to explore a huge block of more than 11,500 sq. miles spread over parts of Buenos Aires and Rio Negro provinces. Seismic work is under way.

. . . Tennessee Argentina is developing a 5,400-sq.-mile area of Argentina's portion of Tierra del Fuego on the southern tip of Latin America.

. . . Union Oil has two areas in Chubut and Santa Cruz provinces totalling 6,100 sq. miles.

Rigs Available in Argentina

Operating company (owner of rig)	Drilling	Completion
Yacimientos Petroliferos Fiscales	72*	2
Pan American (Loffland)	10	4
L. R. Development (Kerr-McGee)	5	0
ASTRA (own)	2	1
Union Oil (Santa Fe)	1	0
Tennessee Gas (Laughlin-Porter)	2†	1
Kerr-McGee (own)	2	2
SAIPEN (ENI)	2	1
Techicagua (own)	0	5
Shell (own)	1†	0
Petro-Tech (Lane Wells)	0	3
Southeastern (own)	2‡	2
TOTAL	99	21

*Two more rigs ordered. †One more rig being shipped. ‡Six more drilling and 6 more completion rigs being readied for shipment.

Public response . . . Expected public opposition to the plan of boosting the oil economy by inviting the foreign contracts never developed generally. Business and professional classes in Argentina recognized the country's dire economic straits and traced the root of the trouble directly to a fuel shortage.

Some opposition did develop among the oil industry labor unions and the lower economic classes in the country still exists. But this opposition is overshadowed by the booming success of the program so far. Much of this opposition comes from the Peronistas.

Buenos Aires taxi drivers are typical of those who still complain. They grouse about the YPF increase in gasoline prices and point bitterly to the fact that petroleum products are being exported to Uruguay. The price hikes were made by YPF to help repay the short-term loans it made abroad to finance the development program.

There was some internal resentment in YPF to the original development contracts granted private companies, but this has been soothed somewhat by the encouraging progress being made toward self-sufficiency.

The second round of contracts, those strictly for drilling and service, were viewed with more favor by the YPF rank-and-file. YPF engineers and other personnel played an important part in the negotiations for this second round of contracts.

Relations between both the oil company and drilling contractors' men and YPF personnel in the field are generally excellent. The Americans now at work in Argentina say that Argentine drillers, armed with new equipment and spurred by national pride, are just as efficient and as fast as American drillers in Comodoro Rivadavia.

Moving the oil . . . Transportation of existing oil and that which is being quickly developed by the drilling programs is YPF's critical problem.

Some relief in this respect will come in 1960 with the completion of the 895-mile 12-in. pipeline linking the shut-in Salta fields with San Lorenzo. This line, now completed and being tested, will move 60,000 bbl. daily—but it is "old' crude that has already been developed.

Crude is now being moved through a portion of the line from Campo Duran to Tucuman and then trucked into Buenos Aires.

Pan American is building for YPF

an 84-mile 12 and 14-in. line from its development contract area in Comodoro Rivadavia to the coast. It should be in operation this year with a daily capacity of more than 50,000 bbl.

Esso is building, for YPF, a 375-mile 14-in. crude line with 24,000-bbl. daily capacity from Plaza Huincul to Bahia Blanca on the coast. The $23 million cost of the line will be amortized over 30 years.

Loeb, Rhoades has also helped finance a part of the facilities which will help solve the transportation problem.

YPF now plans to produce 195,000 bbl. daily this year and boost this output to more than 325,000 bbl. daily in 1961. At this rate it will be supplying for all needs and exporting the surplus easily by the 1964 target date.

Memo to Management

THE MOST revealing oil-industry report of the year will be coming your way next week in the Journal's Annual Review and Forecast Issue.

Journal experts in this 70-page special section predict how many wells the industry will drill in 1960 and the demand and supply outlook for crude, products, and natural gas. It also includes predictions on refinery runs, pipeline construction, and capital investments.

Industry performances in 1959 also will be recorded in important statistics on well completions, footage drilled, new reserves found, volumes of production in every branch of the industry, and finally the big events that affected oil during the last 12 months.

The section is a veritable oil man's handbook of reliable information on which to base company operations or executive decisions. Get it in the Journal's January 25 Review and Forecast Issue.

Caltex Is The Big Winner in Spanish Sahara

MADRID was an old-fashion rumor factory last week on the heels of a government announcement that it had made up its mind on concession awards in the Spanish Sahara.

Successful bidders are being told privately by government officials. But the official list of awards will not be published for at least 2 weeks.

Caltex reportedly came out on top with an award of six blocks. Standard of Ohio will get five concessions. Its partner in the operation, Tidewater, will get four. Tidewater, in turn, is working with Urquijo, a Spanish banking group.

Gulf Oil, in partnership with a local firm, Cepsa, reportedly will receive five blocks. Union Oil, in conjunction with the Fierro banking interests, will get three. Cities Service-Richfield in connection with a government monopoly, Campsa, are to receive four.

A Sun-Pure-Champlin-Fierro group will get two blocks.

Phillips Petroleum is reportedly also scheduled to get two. Atlantic Refining will be awarded one block.

Each of the rectangular-shaped blocks covers about 600,000 acres, and the awards will have a life of 6 years. Oil men in Madrid expect the oil play to cost a total of at least $200 million in the 6-year period.

Interest in the Spanish Sahara has been spurred by discoveries to the east in Algeria and Libya. Its location on the northwest coast of Africa is comparatively close to oil markets, and it is west of Suez.

Applications for exploration rights were made last year under a new oil law that permits exploration in Spain, Spanish Sahara, and Spanish Guinea on more favorable terms.

Gulf Oil and Cepsa have already received a concession covering 328,000 acres in Spanish Guinea. The partners had submitted the only bid for acreage in the small province on the west coast of Africa, north of Gabon.

Acreage in Spain . . . Gulf also has won 10 blocks covering 104,000 acres in Spain in a joint venture with a West German firm, Diehlmann.

Cia. Petrolifora Iberia, in which Sun Oil and Union Oil have two-thirds ownership, won 11 blocks of the mainland covering 156,000 acres. A Jersey Standard affiliate has acquired 10 concessions covering 130,000 acres. Caltex and Campsa have interests in seven blocks covering 88,000 acres.

Esso Buys Half Interest in Libyan Acreage

JERSEY STANDARD has purchased a half interest in three Libyan concessions, one of which has two producing wells and a third under test.

Esso Sirte, Inc., a new affiliate of Standard Oil Co. (N. J.), is the new operator and half owner of Blocks 16, 17, and 20 in Cyrenaica and Tripolitania, held jointly by W. R. Grace & Co., and Libyan American Oil Co., a subsidiary of Texas Gulf Producing Co.

Under the new arrangement, Sirte owns 50% of the concessions, Libyan American 25.5% and Grace 24.5%.

The concessions consist of about 3 million acres. Block 17 has two producers capable of making a total of about 2,000 bbl. daily and a third now being tested. The three wells form a triangle about 10 to 12 miles apart and are believed to be located in the same structure.

A Texas Gulf spokesman in Houston said the deal with Jersey is considered advantageous because it gives Libyan American and Grace a market for their production. A proposed pipeline to nearby production of the Oasis group in Libya may eventually tie in with the Block 17 production.

Under the agreement with Sirte, Libyan American and Grace may sell their share of the production to Sirte.

Sirte plans to drill two new exploration wells this month on a new structure in the western sector of Block 17 and will make the first test of Block 20.

Libyan American and Grace also hold two other Libyan concessions, in the eastern part of the country.

Esso Sirte is Jersey Standard's second operating company in Libya. The first, Esso Standard (Libya), Inc., holds several concessions, including Block 6 on which Zelten oil field was discovered. The latest completion, Zelten 4, is rated at 2,500 bbl. daily. Zelten 5 will be drilled 3¾ miles northwest of the discovery.

Pipe Shortage Slows Russian Projects

• Soviets shave 1960 pipeline construction estimates, but still expect to hit record clip by laying 3,550 miles of pipe.

A SHORTAGE of large-diameter pipe is forcing the Russians to delay some of their pipeline projects, but construction during the early 1960's still will be at a record pace.

Official statements say that production from Soviet pipe mills is covering only 75-80% of the country's requirements. The lag between supplies and needs is expected to continue for some time despite the goals of the present 7-year plan calling for a doubling of pipe production between 1959-65.

In November the government estimated that more than 3,726 miles of pipe would be laid in 1960. Last month the figure was cut to 3,550 miles. This will include 2,273 miles of gas lines and 1,277 miles of crude and products lines.

The curtailment is throwing a monkey wrench into the over-all expansion plans of some regions. A delegate from Kharkov Province has asked the state planning committee to reinstate a project for an "urgently-needed" second gas line from Dashava, in western Ukraine, to Kiev. The loop was authorized for the 1959-60 period, then canceled.

The best hope for a quick solution to the pipe shortage would be to increase imports. If an easing of the cold war permitted, Communist pipe imports from Western countries would have a high priority on Russia's list.

1960 plans . . . At least five natural-gas lines are scheduled to go into operation this year.

A 438-mile line will carry gas from Dashava, in the Carpathian Mountains, to Minsk. A 405-mile line will be completed from Saratov, on the Volga River, north to Gorki via Penza. A 800-mile loop will open on a line from Stavropol, in the northern Caucasus, to Moscow.

Erevan, capital of Armenia, will be supplied by a gas line from Karadag, on the Caspian Sea coast near Baku, which is being routed via Akstafa. The line is the southern branch of a new system from Karadag to Tbilisi, capital of Georgia, which opened in November.

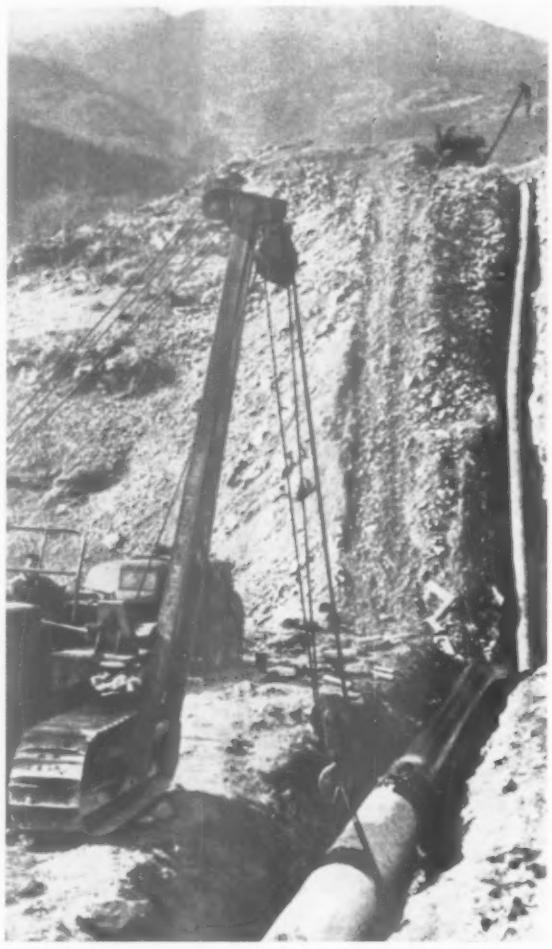
A line also will open from the old caravan city of Samarkand to Tashkent, in central Asia. This is an extension of the Jarkak-Bukhara-Samarkand line and will bring the total length of the system to over 400 miles.

Other gas projects scheduled for completion are a regional grid in the Krasnodar region, north of the Caucasus, and looping programs on existing lines from Taganrog to Zhdanov and from Shebelinka to Dnepropetrovsk.

Biggest job . . . The biggest single pipeline job in Russia this year will be continued work on the 2,300-mile 28-in. trans-Siberian system that will carry crude from European Russia deep into Siberia.

Construction is under way at several points east of Novosibirsk, Siberia. A 487-mile section from Uyar, east of Krasnoyarsk, will be finished by the end of the year. The system will eventually carry crude from Tuimazy fields, west of the Ural Mountains, to Irkutsk, on Lake Baykal in central Siberia.

Work also will continue on a pipeline that will carry crude to a new refinery at Ryazan, southeast of Moscow, from Almetyevsk in Tataria. A line already is carrying crude from Almetyevsk to Gorki. The final section from Gorki to Ryazan is under construction. The refinery is scheduled to go on limited production this year.



RUSSIAN pipeline crew at work on the Karadag-Akstafa-Erevan gas line which crosses the Caucasus Mountains through an 80-ft. pass.

A section being laid from Penza to Bryansk will be the last link in a 700-mile products line running from Novo-Kuibyshev refinery on the Volga into western Russia. Work also will continue on a system from Ishimbai to Orsk in the southern Urals.

Crews also will push work on a 32-in. pipeline that will completely ring Moscow at a radius of about 50 miles. The 310-mile ring will be completed in 1962.

Major projects that will either start or get into full swing this year will include twin 1,200-mile 40-in. lines from Gazli gas field in Uzbekistan to industrial centers in the Urals.

Spreads also will start laying a 40-in. line from Krasnodar fields, north of the Caucasus, to the Moscow area via Rostov and Lugansk. The line will terminate at Serpukhov, which is on the southern edge of the Moscow gas ring.

The industrial area northeast of Moscow will be fed by a new system originating at Gorki. Work also will start on a line from Minsk to the Baltic. The system will start feeding gas to Vilnius, capital of Lithuania, in 1961, and Riga, capital of Latvia, in 1962.

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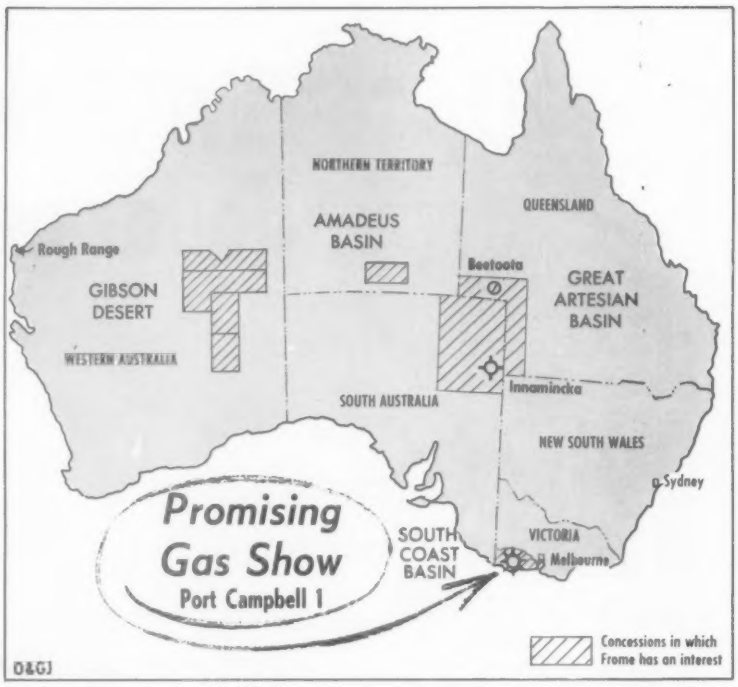
Australia Has Best Show Since 1953 Play

INTEREST in Australia has shifted to Victoria province where Frome-Broken Hill Co. is testing a 4-million-cubic-foot-daily gas discovery.

The company still is running evaluation tests on Port Campbell 1. Results so far have been the most encouraging on the Australian mainland in several years.

The find along the southern coast tests 4 million cubic feet daily along with small amounts of water from a horizon at 5,657 ft. Wellhead pressure is about 1,500 psi.

Frome-Broken Hill recovered only gas-saturated salt water on tests of deeper sandstones at 5,695 ft., 5,756 ft., and 9,908 ft.



Other holdings . . . The company is one of the most active in Australia's growing exploration play.

In addition to its Victoria concession, it holds alone, or in partnership with other groups, interests in acreage in an Amadeus concession in the southern part of Northern Territory, and in the Great Artesian basin. (For a complete review of concessions, see p. 134).

In its latest move, the company has taken out a 2-year prospecting and drilling license in the Gibson Desert.

The 68,400-sq.-mile area is roughly in a shape of a capital "T." It is bordered on the north by the twenty-third parallel, and on the south by the twenty-ninth parallel.

The flat plateau-like area is relatively unknown from a geological standpoint. But it is dotted with sand dunes and numerous rock outcroppings. Its proximity to known basin areas, and surface features spotted in aerial surveys, have stirred interest.

Frome has one-third interest in a wildcatting operation in the Great Artesian basin that has drilled a 12,580-ft. wildcat at Innamincka and is starting another at Betoota. Its partners in the venture are Delhi Australian Petroleum and Santos, Ltd.

Ownership in Frome is divided between international majors and local interests. Standard-Vacuum and British Petroleum each have one-third interest, Zinc Corp. and Interstate Oil hold the remaining third.

Wapet wells . . . The Port Campbell well is one of the most encouraging since Rough Range 1 came in near Exmouth Gulf as a 550-bbl. daily flash-in-the-pan discovery in December 1953 (OGJ, Dec. 14, 1953, p. 99).

The West Australia find was discovered by Wapet, at that time owned by Caltex and a local company, Ampol Exploration. Wapet later found gas in a Cape Range test, but this well also gave out quickly. Royal Dutch-Shell has now joined the group.

The latest gas find adds further hope that commercial oil will some day be found in one of the world's biggest and last remaining unproductive areas. More and more companies are joining the search. Permits are granted without cost, except for exploration obligations, and the government pays up to 50% of the cost of some tests. Royalty on any production will be a comparatively low 10%. Growing demand is now over 216,000 bbl. daily.

▶▶▶ Foreign Briefs

Reports from Hong Kong indicate U. S. Summit Corp. (Panama) is studying a possible refinery project on one of the colony's adjacent islands. The $10-million plant would process crude both for local use and for export.

Batting average of Nigerian wildcatting last year was about one discovery to every four dusters. Shell-BP Petroleum drilled 34 exploration wells and came up with 7 producers and 27 dry holes. Sixteen successful development wells were drilled, and crude exports earned about $2.8 million. This is the first return on a 22-year oil search that has cost $168 million. Growing output is now 15,000 bbl. daily.

The world bank is loaning $56.5 million to Egypt's Suez Canal Authority to help finance improvements in the waterway. Remaining funds for the $107.9-million program will be supplied by foreign and U. S. banks and by the canal authority. The canal is being widened and deepened to handle ships with a 37 ft. draft, which includes vessels up to 46,000 tons. The canal now handles ships with drafts up to 35 ft., or the 36,000-ton class.

A 6,000-bbl. thermal cracker is expected to go on stream this month at the Anglo-Ecuadorian Oilfields refinery at La Libertad, Ecuador. A 7,700-bbl. distillation unit was opened in December.

Construction will start soon on a ethylene plant being built by Shell Chemical (Australia), Pty., at its Clyde refinery, New South Wales, Australia. The ethylene will be sent via pipeline to a polyethylene plant being built at Botany by Imperial Chemical Industries of Australia and New Zealand.

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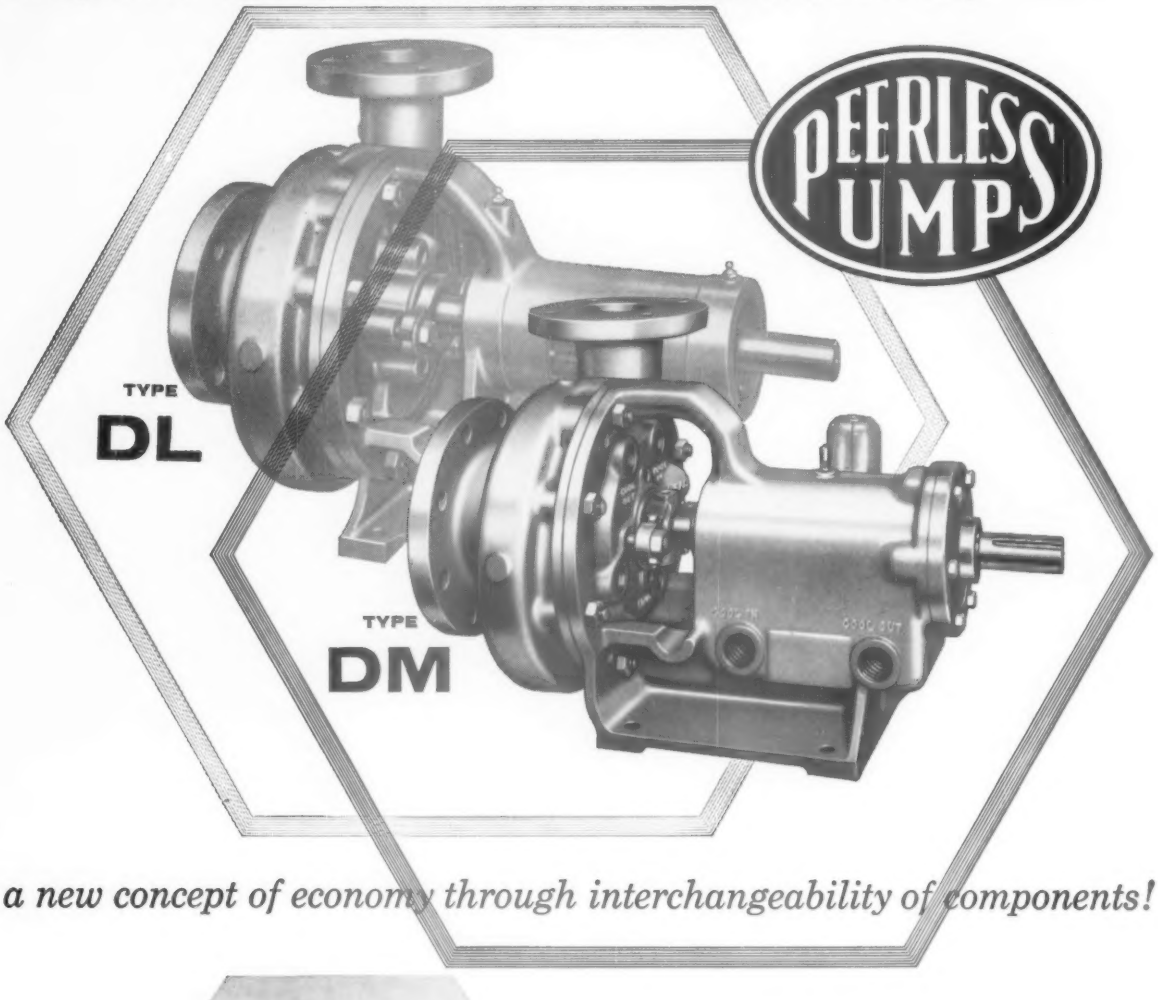

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BY A. P. BUTHOD
Chairman, Department of Chemical Engineering and Petroleum Refining, University of Tulsa, and Consultant, Western Supply Co., Heat Exchanger Division

Charts speed tedious calculations

There is certainly a variety of methods when it comes to rating heat exchangers. However, it is believed that some 90% of the heat-transfer requirements of the refinery or natural-gasoline plant can be handled rapidly with the aid of the charts presented here. This is, of course, exclusive of exchanger problems involving condensation or vaporization which require special treatment and experience for proper handling.

How to estimate heat exchangers

FROM TIME to time the process engineer may be called on to make a quick estimate for a new exchanger or to consider changes in an existing exchanger train. Most process engineers are busy people, are not specialists in heat transfer, and do not have the time to work out transfer coefficients and pressure drops from the equations. It is the purpose here to give the nonspecialist a guide, amply illustrated by examples, for handling such assignments.

The reference list which is included is not a complete bibliography, but it is a cross-section of heat-exchange literature for further background on the subject. Aside from this a basic approach is taken in this report as follows:

1. Heat balance. This requires the amount of each fluid involved in heat transfer and the desired change in temperature to calculate the load on the exchanger. The Scheibel and Jenny chart for heat content of hydrocarbons is reproduced to facilitate such calculations.

2. Mechanical design. Some understanding of exchanger construction is, of course, necessary. This is to be found in some detail elsewhere as, for example, in the TEMA manual,[1] Kern's book,[2] or the special report by Donohue.[6] Remarks on mechanical design are kept to a bare minimum here. Such design is properly the province of the exchanger rating engineer who does this work all the time.

3. Basic heat-transfer equation. This is reviewed very briefly with notes on MTD (mean temperature difference) and corrected MTD, temperature approach, and the equation for over-all coefficient in terms of film coefficients with fouling factors included.

4. Film coefficients. Charts are given to facilitate determination of film coefficients on the tube side. Other charts are used to help estimate the shell-side coefficient as an average of the crossflow and longitudinal-flow coefficients.

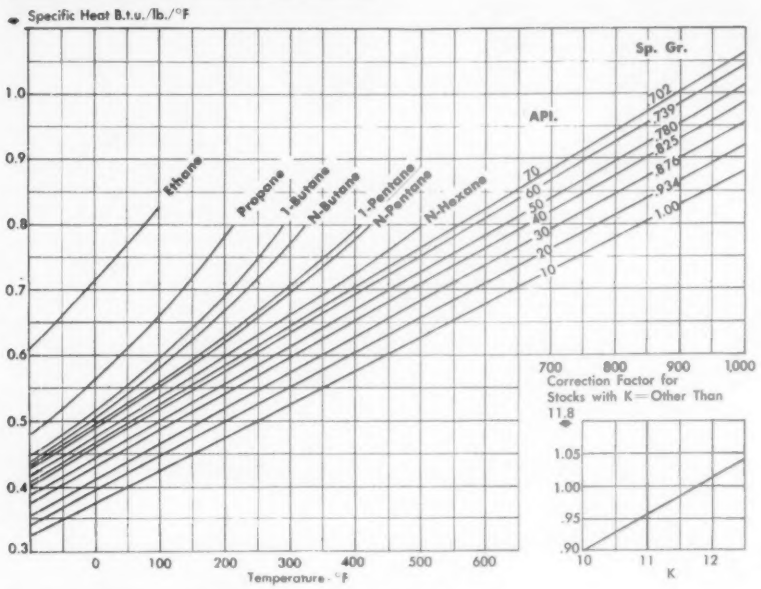
5. Pressure drop. Step-by-step procedure is outlined for tube-side pressure drop and on the shell side it is taken as the sum of the estimated crossflow and longitudinal-flow pressure drops.

Selecting Exchangers

Before getting down to brass tacks on exchanger design, a few words are in order on selection of shell-and-tube exchangers. This discussion is taken from the article by Anderson and Flaxbart.[4] There are three basic types of shell-and-tube exchangers: (1) floating head, (2) U-tube, and (3) fixed-tube sheet.

1. Common tube sizes. They are the ¾-in. and 1-in. o.d. With proper specification of tube passes, these diameters give adequate velocity without excessive pressure drop. Cleaning is not difficult. Tubes of these diameters (and in wall thicknesses from 12 to 16 BWG [Birmingham wire gage]) are ordinarily stock items.

2. Tube length. Today, 16 and 20-ft. tubes are standard. For refineries, the 16-ft. tube is preferred due to more limited space available in the refinery, bundle-handling requirements,



SPECIFIC HEATS of hydrocarbon liquids. Fig. 1.

and fouling considerations. For natural-gasoline plant, the 20-ft. tube is preferred since gasoline-plant fluids are cleaner and there is usually more room to move in.

3. Shell diameters. For refineries, maximum shell diameter of about 36 in. is preferred, again because of ease of handling. In gasoline plants, less maintenance is required (and hence less handling) due to cleaner fluids, so larger diameters—up to 42 or 44 in.—are often used.

4. Tube pitch. This is usually a square or triangular layout. The square pitch is for fouling fluids (where mechanical cleaning is required), or for low pressure drop. Triangular pitch is for clean fluids; it results in higher transfer coefficient for given pressure drop.

The reader is referred to Anderson and Flaxbart[5] for more on costs, comparison of exchanger types, etc.

Heat Balance

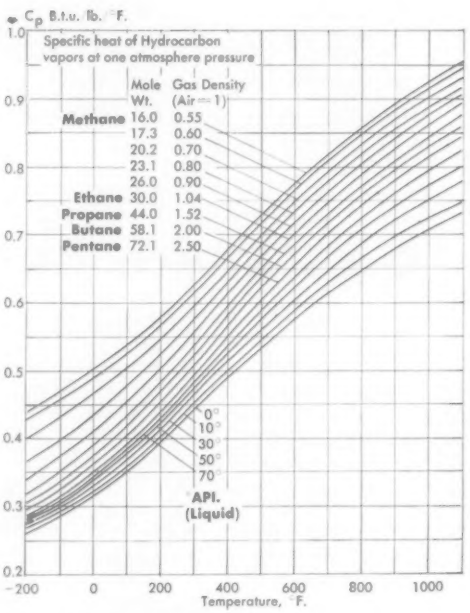
The heat balance is expressed by:

$$q = WC\,(t_1 - t_2)$$

where:

q = sensible heat transferred, B.t.u./hr.
W = weight of fluid stream, lb./hr.
t = temperature, °F.
C = specific heat, B.t.u./lb.-°F.

Figs. 1 and 2 give values of specific heat to be used in sensible-heat-transfer calculations. Fig. 3 is the Scheibel and Jenny total heat chart which can be used in heat-balance calculations where latent as well as sensible heat is involved.



SPECIFIC HEATS of hydrocarbon vapors. Fig. 2.

Example 1: The first-stage intercooler in a compressor station is to handle 12,000 lb. per hour of 0.6-sp.-gr. natural gas at 40 psig. and cool it from 160° to 90° F. by cooling water heated from 80° to 95° F. What is the duty in B.t.u. per hour and how many gallons per minute of water will be required?

Solution: It will be assumed that at 40 psig. it will not be necessary to correct the specific heat for pressure, and the data from Fig. 2 will be satisfactory. For data on specific heats at high pressure, see Buthod, The Oil and Gas Journal, September 8 and September 29, 1949. At the average gas temperature of 125° F. the specific heat of 0.6-sp.-gr. gas is 0.537.

The intercooler duty is:

$$12{,}000 \times 0.537\,(160 - 90)$$

$$= 451{,}000 \text{ B.t.u./hr.}$$

The heat absorbed by the water must be the same amount. Using a specific heat of 1.0 for water, the amount required is:

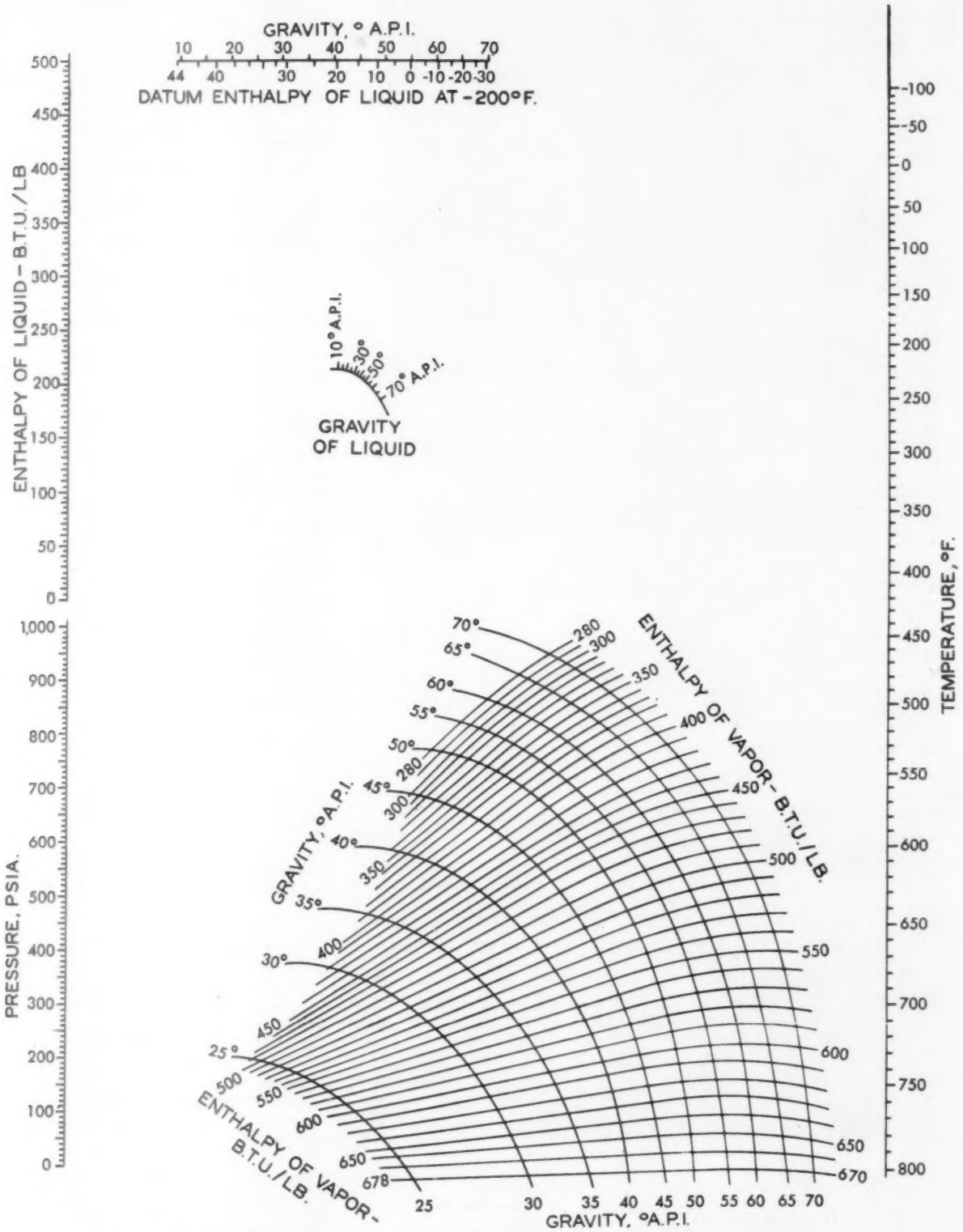
$$451{,}000/1.0\,(95 - 80)$$

$$= 30{,}000 \text{ lb./hr.}$$

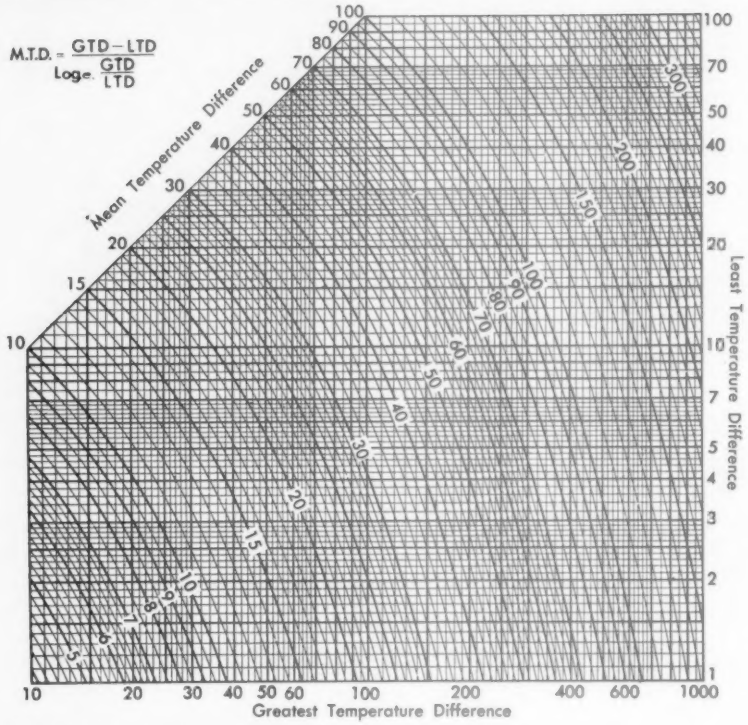
This is equivalent to:

$$30{,}000/8.33 \times 60 = 60 \text{ g.p.m.}$$

Example 2: A crude fractionator handles 25,000 bbl. per day of 40°-API crude with a characterization factor K = 12.0 and makes 32 vol. % of 63°-API gasoline overhead. The reflux ratio is 2.2 lb. of cold reflux per pound of product. The tower pressure is 20 psig. and the top tower temperature is 320° F. What must be the condenser duty to condense and cool the net product and reflux to 90° F.? What portion of this cooling can be done by the incoming crude stream if it is available at 80° F. and can approach the vapor temperature within 60° F.? The pressure on the crude oil will be sufficient to suppress vaporization.



TOTAL HEATS of hydrocarbons, including sensible and latent heats. Fig. 3. (Reprinted from Industrial & Engineering Chemistry, vol. 37, p. 994, October 1945. Copyright 1945 by American Chemical Society and reprinted by permission of the copyright owner).



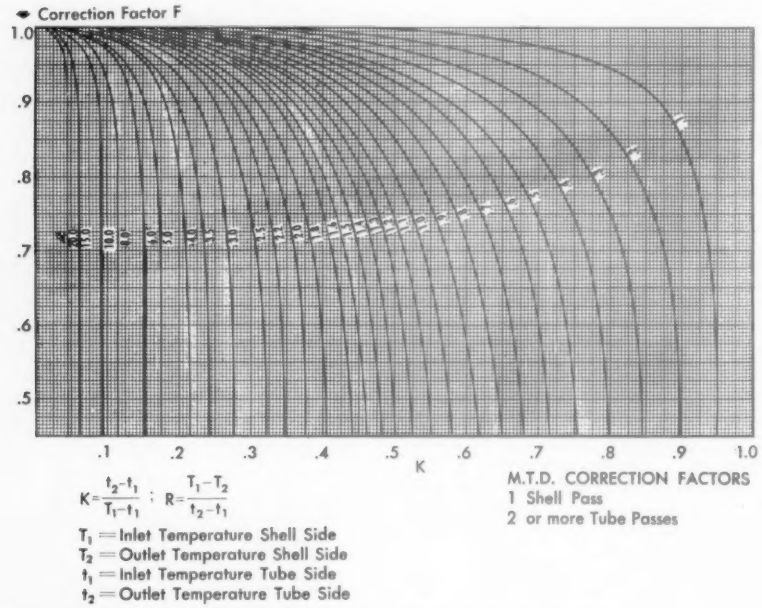
LOG MEAN Δt DETERMINATION by graphical means. Fig. 4.

Solution: Since both latent and sensible heat are involved on the gasoline side, it is better to use enthalpy or total heat rather than specific heat. Fig. 3 will be used (Nelson, Petroleum Refinery Engineering, 4th ed., p. 905, gives the pound per gallon figures for the gasoline and crude as 6.056 and 6.870, respectively).

The quantity of gasoline product is:

$$25{,}000 \times (42/24) \times 0.32 \times 6.056$$

$$= 84{,}800 \text{ lb./hr.}$$



MTD CORRECTION-FACTOR CHART for heat exchangers. Fig. 5.

The quantity of gasoline product and reflux is:

$$84{,}800 (1 + 2.2) = 272{,}000 \text{ lb./hr.}$$

The heat content of 63°-API vapor at 320° F. and 35 psi. is 363. The heat content of 63°-API liquid at 90° F. is 110.

The total condenser duty is:

$$272{,}000 (363 - 110)$$

$$= 68{,}700{,}000 \text{ B.t.u./hr.}$$

The qualtity of crude oil is:

$$25{,}000 \times (42/24) \times 6.870$$

$$= 300{,}000$$

Because of the large quantity of gasoline and reflux as compared with the crude, and the presence of latent as well as sensible heat, it is apparent that the closest approach will be at the hot end of the exchanger. The crude will leave at a temperature of 320 − 60 = 260° F.

The heat in the crude being all sensible, the specific heats of Fig. 1 will be used. The average oil temperature is 170° F. The specific heat corrected for characterization factor is 0.523 × 1.01 = 0.528.

The crude-oil duty is:

$$300{,}000 \times 0.528 (260 - 80)$$

$$= 28{,}700{,}000 \text{ B.t.u./hr.}$$

In order to find the temperature and condition of the gasoline stream as it leaves the crude-to-gasoline exchanger-condenser, it is necessary to combine a knowledge of the vapor-liquid equilibrium relationship with the above heat balance.

Mechanical Design

The determination of tube-side film coefficient and pressure drop is a relatively simple matter. Most engineers have been exposed to the tube-side calculations during the undergraduate course in school. But the shell-side calculations are much more complex. There are two prime items that require consideration in shell-side calculations. These are: (1) crossbaffling, and (2) tube layout.

Crossbaffles . . . These are used for two reasons: (1) the tubes require support so that they will not sag, and (2) baffling promotes turbulence and hence results in higher heat-transfer coefficient on shell side (as well as greater pressure drop). Various types

of baffles have been used in exchangers such as orifice baffles (suitable only for very clean fluids), disk-and-doughnut, etc. However, segmental baffles are the rule in refinery use. These are just what the name implies: a segment (referred to as the cut or window) is sliced off the circular baffle.

The fluid comes into the shell, distributes itself, and flows longitudinally (parallel to the tubes). Then it has to squeeze through the baffle window and after this is directed by the baffle into crossflow (transversely across the tubes). This pattern of longitudinal flow followed by crossflow is repeated until the fluid leaves the shell. Thus in an exchanger with eight baffles the fluid will travel across the bundle nine times.

This is complex enough in itself. But in addition there is also bypassing (leakage) between the baffle edge and shell wall and between the tubes and tube holes in the baffle. Note also that as the fluid flows across the tube bundle the velocity changes continuously. The fluid at first encounters no tubes (next to the shell wall) as it begins its transverse flow, then the number of tubes increases from row to row to a maximum at the center of the shell.

From this discussion, it is evident that two velocities are involved in shell-side calculations—a longitudinal velocity G_L and a crossflow velocity G_x. Both are mass velocities as used here in pounds per second per square foot.

Tube layouts . . . From the layout tables given here (Figs. 17 and 18), it is easy to determine total number of tubes, rows across, and the net free distance for any size shell; this last term (net free distance) is explained later on.

Basic Heat-Transfer Equation

The basic equation for convection is:

$$q = UA\,\Delta t$$

where:

- q = heat transferred, B.t.u./hr.
- U = over-all coefficient of heat transfer, B.t.u./hr.-ft.^{2}-°F.
- A = area through which heat transfer takes place, ft.^{2}
- Δt = temperature difference or driving force for heat transfer, °F.

Fluids in heat exchange may be in counterflow or parallel flow. The temperature changes as the two fluids exchange heat along the length of the exchanger; therefore in determining Δt we must average the temperature and we come out with a mean temperature difference (MTD). An arithmetic mean temperature difference may be used. A more accurate expression is the log mean temperature difference (LMTD) as given by:

$$\Delta t_{in} = \text{LMTD} = \frac{(T_1 - t_2) - (T_2 - t_1)}{\text{Log}_e\,(T_1 - t_2 / T_2 - t_1)}$$

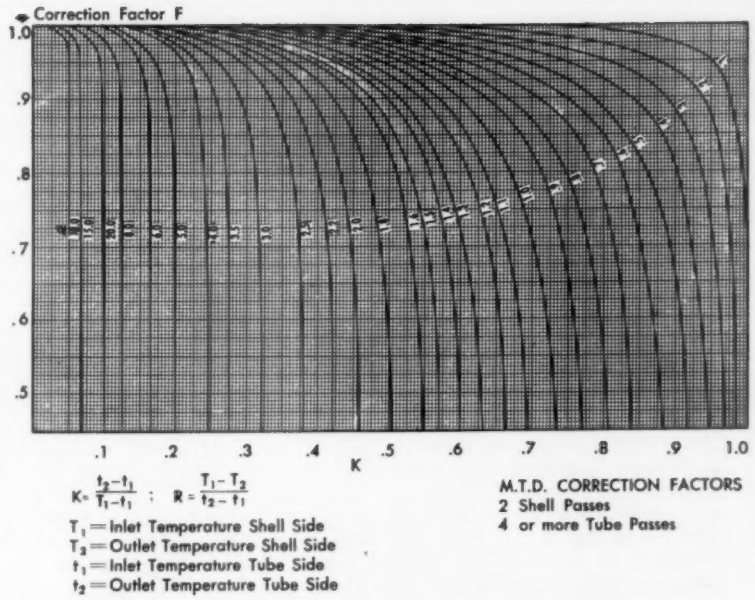
$$= \frac{\text{GTD} - \text{LTD}}{\text{Log}_e\,\text{GTD/LTD}}$$

where:

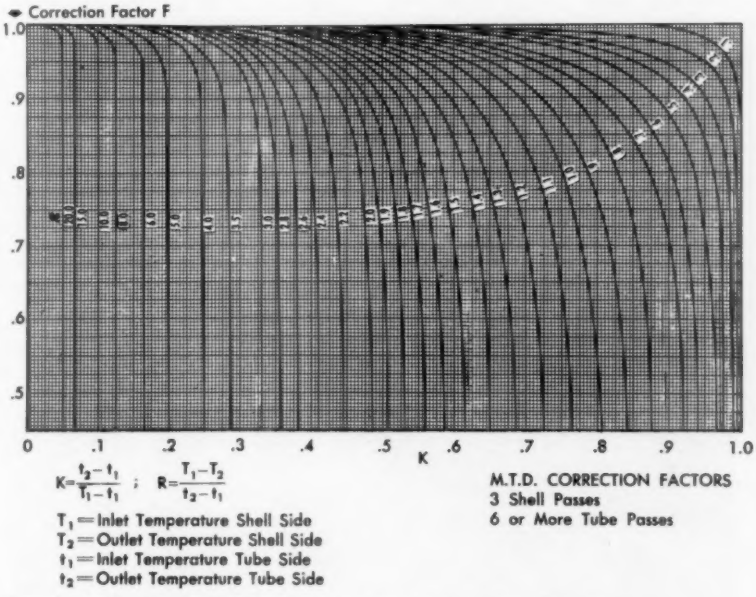
T_1 and T_2 are the terminal temperatures of one fluid and t_1 and t_2 of the other fluid. GTD is the greater temperature difference (at one end of the exchanger or path of travel) and LTD is the least temperature difference (at the other end of the exchanger).

For convenience this relationship is plotted as a chart (Fig. 4).

In most exchangers we have a combination of counterflow and parallel flow. For example, in an exchanger with two tube passes there is counterflow in one pass and parallel flow in the other. Accordingly charts have been worked out from which a cor-



MTD CORRECTION-FACTOR CHART for heat exchangers. Fig. 6.



MTD CORRECTION-FACTOR CHART for heat exchangers. Fig. 7.

"There's more to exchanger economics than price of the exchanger"

THERE ARE a number of factors to be considered after the general heat-transfer problem has been defined. By experience, it is found that several of these are not always given consideration, while others are too often overlooked, or completely forgotten. Thorough consideration is usually given to the materials of construction required by the process service. Usually the type of exchanger is well thought out and a conclusion reached prior to vendor solicitation. The advisability of using a floating-heat, U-tube, or a fixed-tube-sheet-type exchanger is usually defined by the pressure temperature, or corrosiveness of the service. Most of the time it can be seen which fluid should be on the shell or tube side of the exchanger. Dirty fluids, high-pressure fluids, or corrosive fluids are usually put on the tube side, although other considerations must often be taken into account. Plant practice usually determines the tube diameter and length, and the tube pitch can quickly be determined, depending on the fouling characteristics of the service.

Delivery requirement is usually defined at the time the problem is defined, so this requires little additional thought. It must be remembered that delivery in many cases will affect the cost, since quick deliveries often require the adapting of stock materials, rather than allowing time for the purchase of what is actually needed. Shop overtime and additional shop time adapting materials will increase cost.

The following factors are often overlooked in setting up the specifications for equipment. Savings can often be effected by a thorough study of the fluid temperatures. Close approach temperatures can send the surface requirement soaring. Temperature crosses necessitate the use of more costly multishell pass exchangers, or the use of several shells in series. Heat-content curves allow the exchanger designer to more accurately size the requirement, thus eliminating the possibility of either excess surface, or not enough surface to a given requirement.

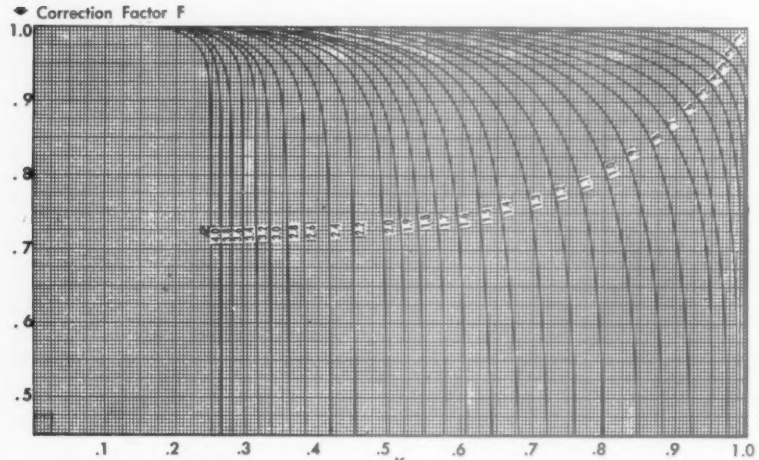
It is essential that the physical properties of the fluid be accurately specified. This is especially true of the viscosities of liquids, particularly with regard to petroleum oils heavier than 35° API. It is amazing how often a viscosity may be specified without noting the temperature at which this viscosity applies.

In many cases, insufficient thought is given to allowable pressure drops. There is a tendency to specify 10 psi., irrespective of the type of service or properties of the fluids. Additional pressure drop to allow higher water velocities, or to perhaps bring a design out of the viscous flow region, can save many dollars.

In conclusion, it is essential to keep in mind that there is more to exchanger economics than the price of the exchanger. It is necessary to be aware of, and to pay attention to, certain problem modifications that will not materially affect the problem, but can save considerable money on heat-exchange equipment. Time can be saved by fixing certain of the design variables that only the purchaser-engineer, having a knowledge of the process and requirement, can establish. Much time can be saved by incorporating all accumulated information into a concise and clearly defined inquiry. Soliciting reputable vendors with complete design staffs will take many of the time-consuming problems away from the purchaser-engineer. Then, having chosen such a vendor, additional time can be saved by not worrying about insignificant details of design that the vendor is better equipped to handle.

E. W. Flaxbart
Western Supply Co.
Tulsa

(From remarks made at 1959 Oklahoma State AIChE meeting, Oklahoma State University, Stillwater.)

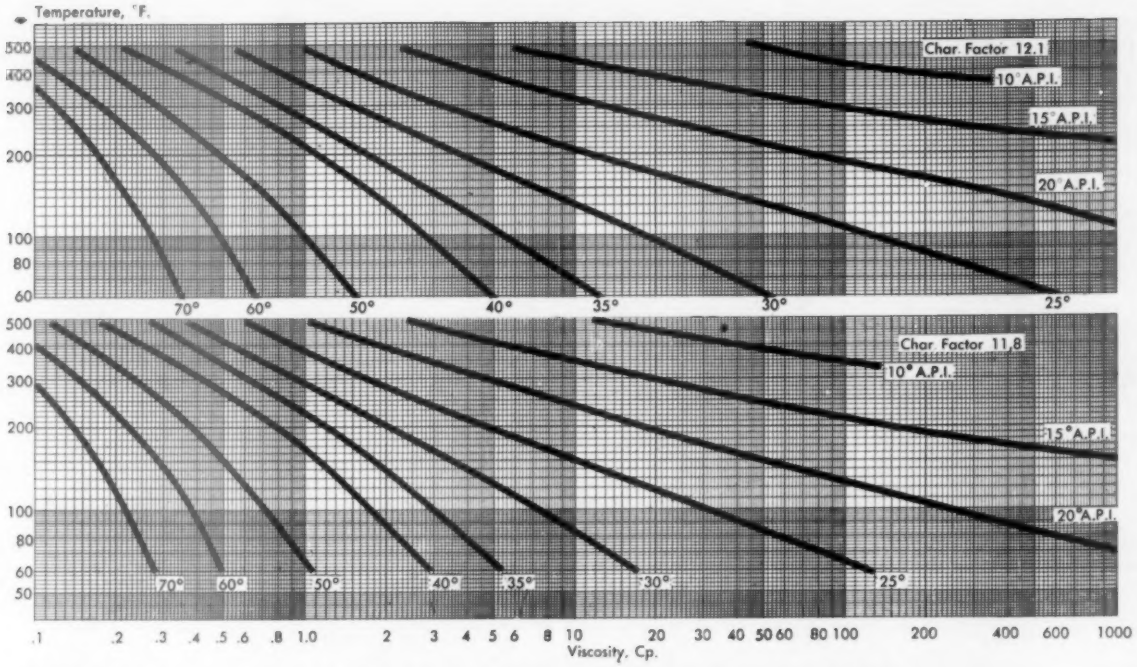


MTD CORRECTION-FACTOR CHART for heat exchangers. Fig. 8.

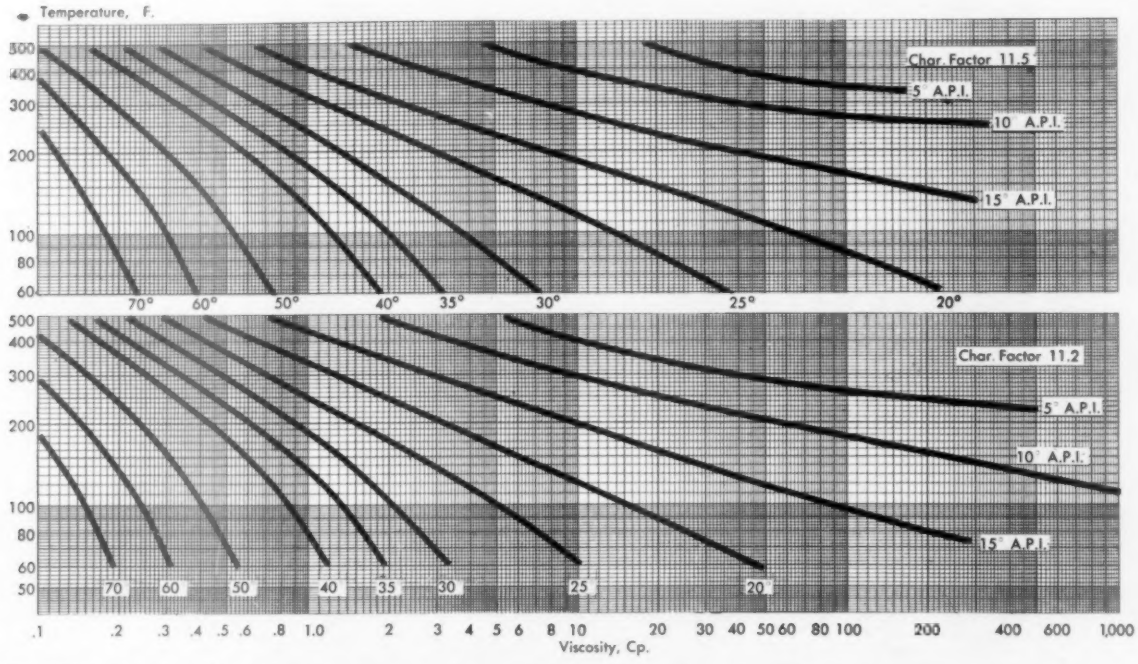
rection factor F is obtained. The LMTD is multiplied by this factor and the resulting "effective" MTD is used in the basic heat-transfer equation. MTD correction-factor charts are reproduced here (Figs. 5-8 inclusive). The parameters R and P which are used to obtain the correction factor are defined on the charts. It is recommended that a factor (F) lower than 0.8 not be used in design of exchangers.

Example 3. Lean oil in a gasoline plant leaves the still at 410° F. and is to be cooled in the shell of an exchanger with rich oil available at 110° F. in the tubes. A 45° approach is decided upon; this takes the lean oil to 155° F. By a heat balance the exit temperature of the rich oil is found to be 330° F. Find the mean-temperature difference to be used in designing the exchanger.

Solution: First assume that the flow will be countercurrent and that a log-mean-temperature difference ap-



VISCOSITY of hydrocarbons. Fig. 9. (Reprinted from Production Handbook, McGraw Hill Book Co.)



VISCOSITY of hydrocarbons. Fig. 10. (Reprinted from Production Handbook, McGraw Hill Book Co.).

plies without correction:

Greater temperature difference, 410 − 330 = 80.

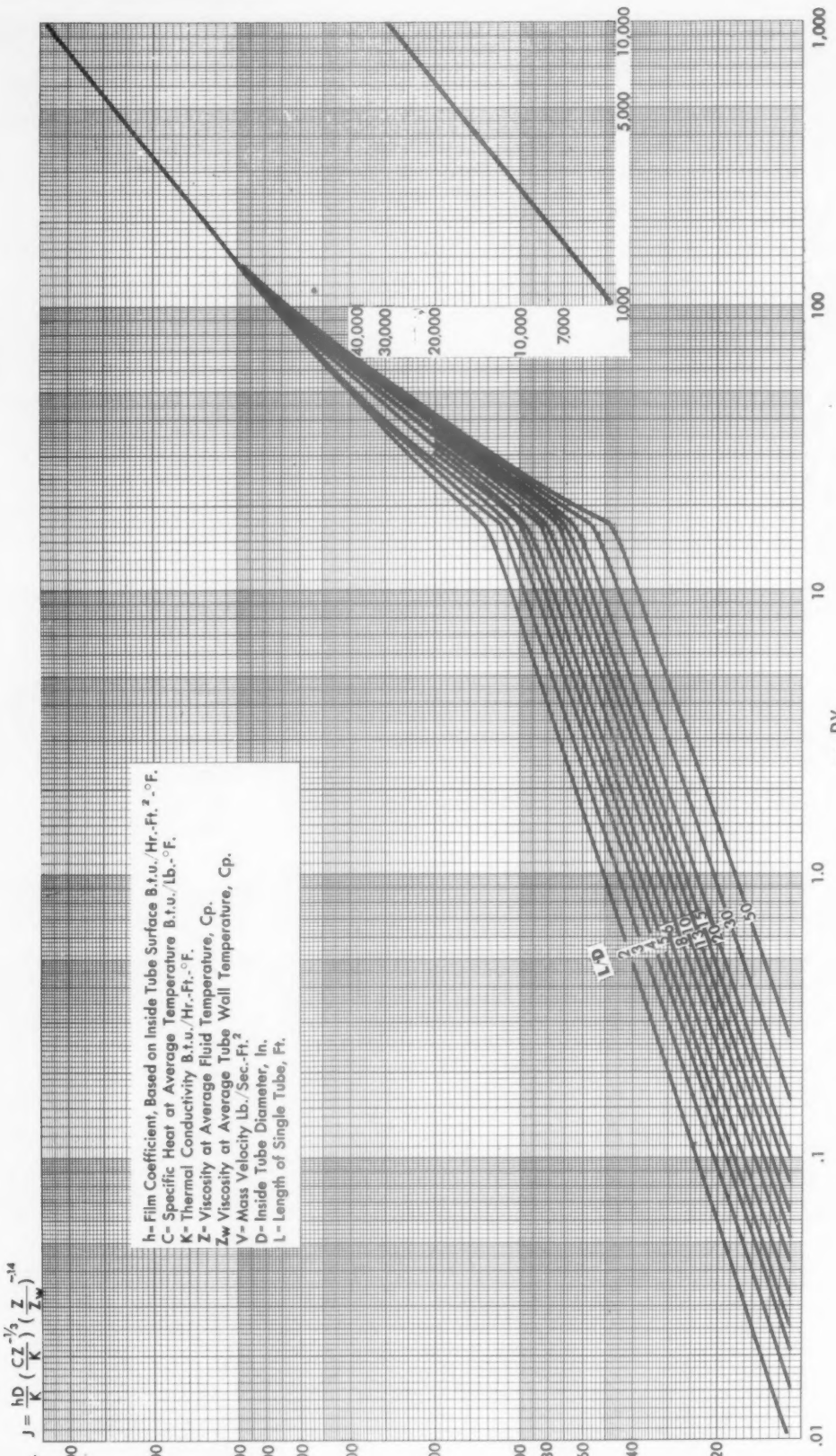
Least temperature difference, 115 − 110 = 45.

Log - mean - temperature difference (from Fig. 4) is 60.8° F.

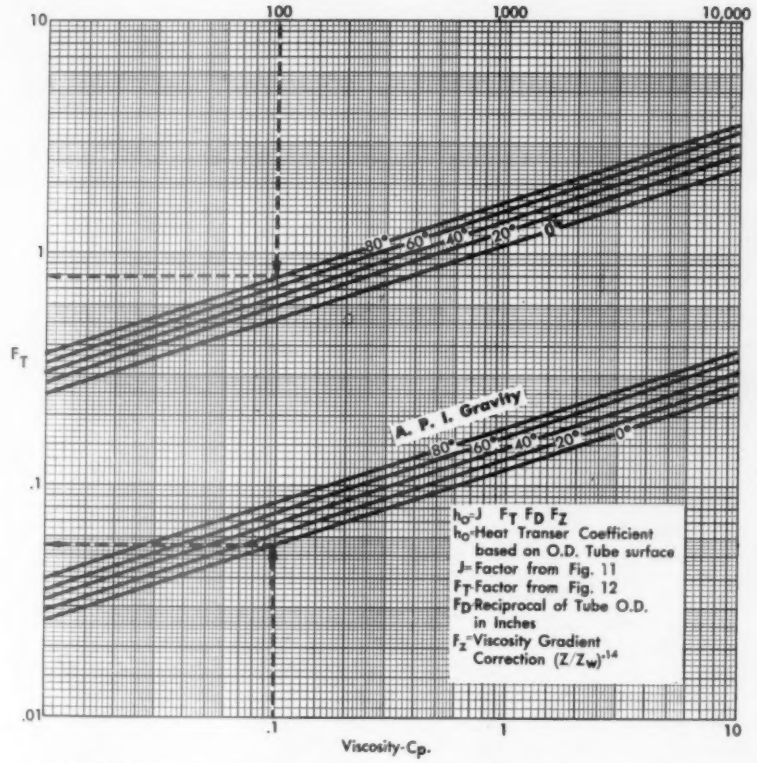
If the same number of shell passes as tube passes is used in designing the exchanger system, the uncorrected log-mean-temperature difference will be sufficient. This is not the usual case, however, and a correction will be calculated for several cases.

$$\text{The ratio } R = \frac{410 - 155}{330 - 110} = 1.16$$

$$\text{The ratio } P = \frac{330 - 110}{410 - 110} = 0.733$$


$J = \frac{hD}{K}\left(\frac{CZ^{-1/3}}{K}\right)\left(\frac{Z}{Z_w}\right)^{-14}$
h- Film Coefficient, Based on Inside Tube Surface B.t.u./Hr.-Ft.²-°F.
C- Specific Heat at Average Temperature B.t.u./Lb.-°F.
K- Thermal Conductivity B.t.u./Hr.-Ft.-°F.
Z- Viscosity at Average Fluid Temperature, Cp.
Z_w Viscosity at Average Tube Wall Temperature, Cp.
V- Mass Velocity Lb./Sec.-Ft.²
D- Inside Tube Diameter, In.
L- Length of Single Tube, Ft.
L/D
$N = \frac{DV}{Z}$

HEAT TRANSFER to fluid inside tubes. Fig. 11.



HEAT TRANSFER to hydrocarbons inside tubes. Fig. 12.

The factor F is found from Figs. 5, 6, 7, and 8, as follows:

One-shell, two or more tube passes, $F < 0.8$.

Two-shell, four or more tube passes, $F < 0.8$.

Three-shell, six or more tube passes, $F < 0.8$.

Four-shell eight or more tube passes, $F = 0.83$.

In order to do this job, it will take at least four single-shell pass exchangers or two two-shell pass exchangers connected in series. The mean temperature difference to be used in this case is:

$$MTD = 60.8 \times 0.83 = 50.5° \text{ F.}$$

To obtain the required effective surface or transfer area of the exchanger, it is necessary to determine the over-all coefficient U in the basic heat-transfer equation. This over-all coefficient is designated as U_d in the TEMA manual[1]—i.e., design over-all coefficient of heat transfer. The transfer area A is calculated on the basis of outside tube surface.

In operation, depending on the particular service, the exchanger will often become fouled. The dirt film on inside or outside of the tubes constitutes an additional resistance to heat flow. Therefore fouling resistances are included in the equation for the over-all transfer coefficient which is given in terms of individual coefficients on shell side and tube side as:

$$1/U_d = (1/h_o) + r_o + r_w + r_i(A_o/A_i) + [(1/h_i)(A_o/A_i)]$$

where:

U_d = design over-all (service) coefficient.

h_o = film coefficient on outside of tube (shell side).

h_i = film coefficient on inside of tube (tube side).

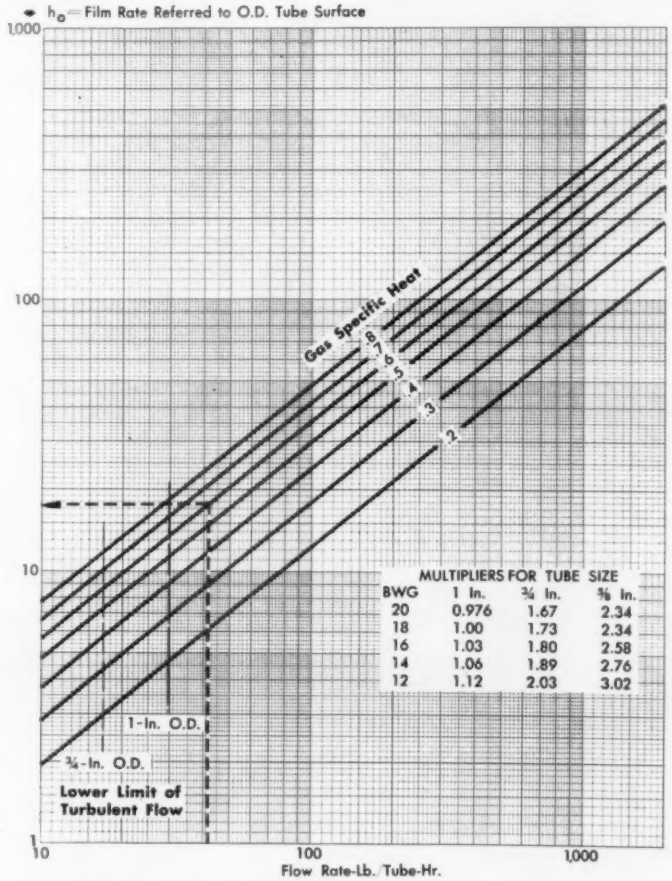
r_o = fouling resistance on outside of tube.

r_i = fouling resistance on inside of tube.

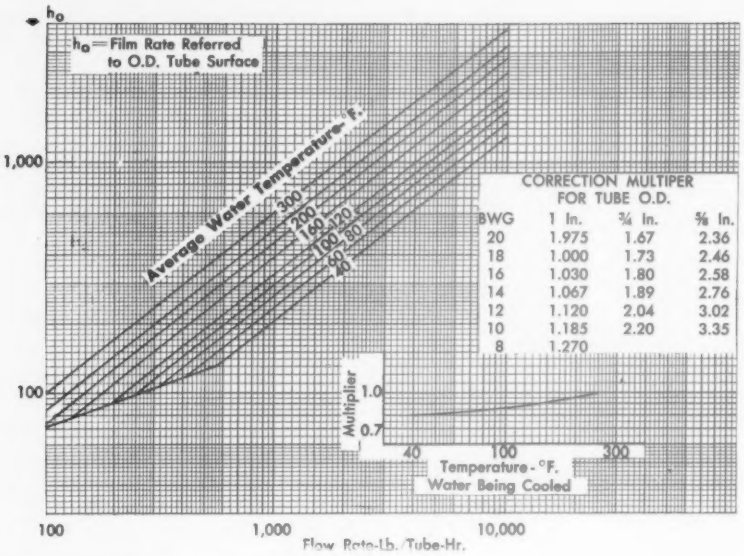
r_w = resistance of tube wall; this is defined as L_w/K_w where L_w is thickness of tube wall and K_w is wall conductivity.

A_o/A_i = ratio of outside tube surface to inside tube surface.

The selection of the proper fouling factor is not easy. Experience is the best guide. However, some help can



HEAT TRANSFER to gases inside tubes. Fig. 13.



HEAT TRANSFER to water inside tubes. Fig. 14.

be obtained from the TEMA manual[1] which lists fouling factors for normal and extreme fouling conditions; also see Nelson.[4]

Method of Design-Tube Side

Tube-side transfer rate:

Determine the tube-side film coefficient.

The basic equation is that of Sieder and Tate, and there are various modifications. The equation used here is:

$$J = (hD_i/K)\,(CZ/K)^{-1/3} \times (Z/Z_W)^{-0.14} \quad (1)$$

where:

J = the heat-transfer function related to Reynolds' number.
h = film coefficient based on inside tube surface, B.t.u./hr.-ft.^{2}-°F.
C = specific heat at average temperature, B.t.u./lb.-°F.
K = thermal conductivity, B.t.u./hr.-ft.-°F.
Z = viscosity at average bulk temperature, cp.
Z_W = viscosity at average tube-wall temperature, cp.
D_i = inside tube diameter, in.

In this equation the film coefficient is based on inside tube area and must be corrected as follows:

$$h_o = J\,[K\,(CZ/K)^{1/3} \times (1/D_i)] \times (Z/Z_W)^{0.14} \times (D_i/D_o) \quad 1A$$

where:

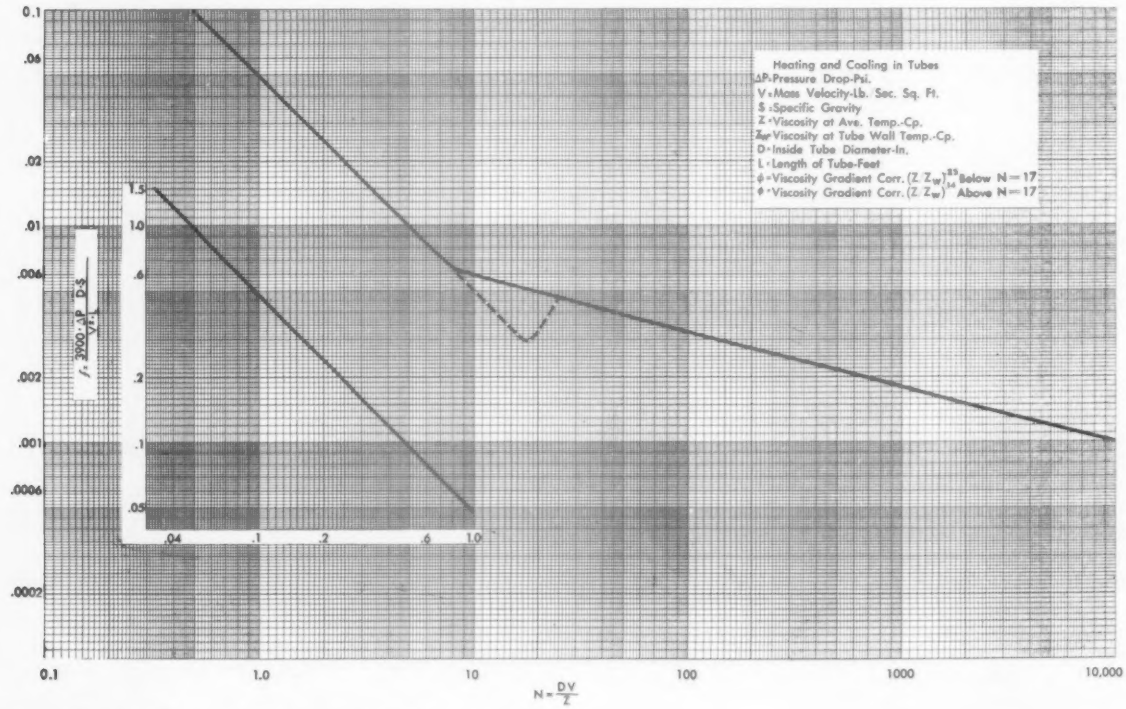
h_o = tube-side coefficient based on outside area.

Let the group $K\,(CZ/K)^{1/3} = F_T$, and $(1/D_o) = F_D$.

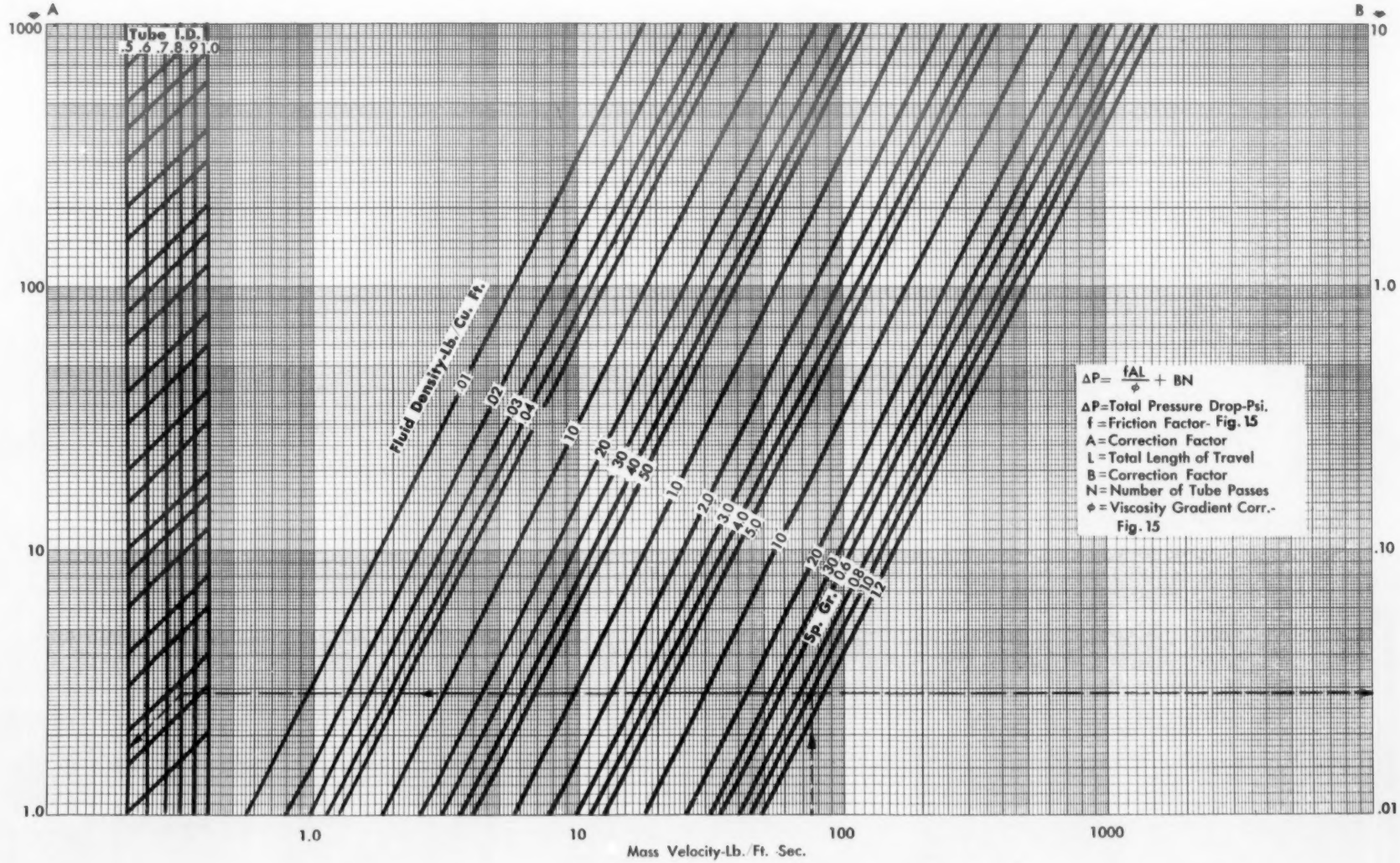
These two factors F_T and F_D will be read from charts later.

Note the chart (Fig. 11). This plots the modified Reynolds' number:

$$N = (DG/Z)$$



FRICTION FACTOR for fluids flowing inside tubes. Fig. 15.



PRESSURE DROP for fluids flowing inside tubes. Fig. 16.

TUBE LAYOUTS
Number of 3/4-In. O.D. Tubes on 15/16-In. Triangular Pitch

Shell i.d. (in.)	Number of tube passes 1	2	4	6	8	Net free distance	Rows across
8	42	34	27	27	...	3.4	11
10	69	60	54	54	...	4.0	15
12	102	95	82	80	...	4.6	19
13	124	114	102	100	...	4.9	23
15¼	184	172	154	150	...	5.6	27
17¼	238	228	205	198	...	6.2	31
19¼	308	290	273	266	...	6.8	35
21	360	348	315	304	...	7.3	39
23	430	418	394	370	370	7.9	43
25	524	512	488	480	480	8.5	47
27	615	602	578	578	570	9.1	51
29	730	718	690	686	686	9.7	55
31	835	820	794	790	790	10.3	59
33	980	960	930	920	920	10.9	65
35	1,090	1,070	1,040	1,030	1,030	11.5	69
37	1,230	1,210	1,180	1,170	1,170	12.1	73
39	1,360	1,340	1,310	1,300	1,300	12.7	77
42	1,520	1,500	1,470	1,460	1,460	13.6	81

TUBE LAYOUTS for tubes on triangular pitch. Fig. 17.

TUBE LAYOUTS
Number of 1-In. O.D. Tubes on 1¼-In. Square Pitch

Shell i.d. (in.)	Number of tube passes 1	2	4	6	8	Net free distance	Rows across
8	21	16	16	14	...	3	5
10	32	32	26	24	...	4	6
12	48	44	40	37	...	5	8
13	60	56	51	50	...	4	9
15¼	88	82	75	70	...	5¼	11
17¼	112	110	102	98	...	5¼	12
19¼	148	142	136	129	...	6¼	14
21	170	168	157	150	...	7	15
23	210	199	197	186	...	8	17
25	250	248	224	216	217	8	17
27	286	275	267	257	254	10	19
29	348	340	322	314	313	9	21
31	390	391	366	366	348	10	23
33	460	453	430	420	424	10	25
35	517	513	487	486	480	10	25
37	588	580	555	544	538	11	27
39	645	637	619	610	605	12	29
42	745	728	708	686	685	14	31

TUBE LAYOUTS for tubes on square pitch. Fig. 18.

versus the function J of Equation 1. On the chart (Fig. 11) are the three regions of: (1) Viscous or streamline flow where the ratio L/D enters into the equation, (2) the transition region for which there is no precise mathematical expression, and (3) the turbulent region for which Equation 1 holds. In the viscous region the heat-transfer coefficient is proportional to the cube root of the mass velocity inside the tube. In the region of true turbulence, the transfer coefficient is proportional to the 0.8 power of the mass velocity.

Procedure for Tube-Side Coefficient

1. Calculate tube-side mass velocity G, and the Reynolds' number N and from Fig 11 determine value of function J.

2. From Fig. 12 determine F_T.

3. Determine F_z = viscosity corrective factor $(Z/Z_W)^{0.14}$. (Ordinarily F_z can be neglected except when dealing with a very viscous oil or if the temperature drop across the film is very large.

4. The tube-side film coefficient based on outside tube diameter, h_o, is then determined as:

$$h_o = J\,F_T\,F_D\,F_z$$

Example 4: A crude fractionator condenser has gasoline in the shell and water in the tubes. The unit has a total of 440 admiralty tubes of ¾ in., 16 BWG, 16-ft. length arranged in four tube passes. Water at 85° F. flows at the rate of 35 g.p.m. and leaves at 100° F. Estimate the film coefficient for water under these conditions.

Solution: The flow rate of the water in the tubes is:

$$\frac{350 \times 60 \times 8.33}{440/4} = 1{,}590 \text{ lb./tube-hr.}$$

Using Fig. 14 the value of h_o is obtained:

$$h_o = 410 \times 1.80$$

$$= 740 \text{ B.t.u./hr.-ft.}^2\text{-°F.}$$

This is an inside film coefficient but is based on the outside surface area of the tube since resistances must be brought to a common transfer-surface basis before all the resistances are added: the outside surface is the usual basis. The factor to be applied for water being cooled is obviously not necessary in this case.

This is a clean coefficient and before applying it to design a fouling factor must be selected and applied.

Example 5: A catalytic reformer feed-effluent exchanger uses a series of U-tube exchangers with the effluent in the tubes. The effluent enters the hot exchanger at 750° F. and is cooled to 550° F. The total flow of hydrogen and naphtha is 80,000 lb. per hour and because of the presence of hydrogen the specific heat of the mixture is high, 2.2-B.t.u./lb.-°F. There are 340 alloy tubes 1-in. in diameter, 12-BWG, 32-ft., two-pass U-tubes in each of the exchangers connected in series. What will be the film coefficient for the effluent under these conditions?

Solution: The flow rate for the effluent is:

$$80{,}000/340 = 235 \text{ lb./tube-hr.}$$

Note that the number of tubes listed is the number of U-bends and therefore the 340 is not divided by 2.

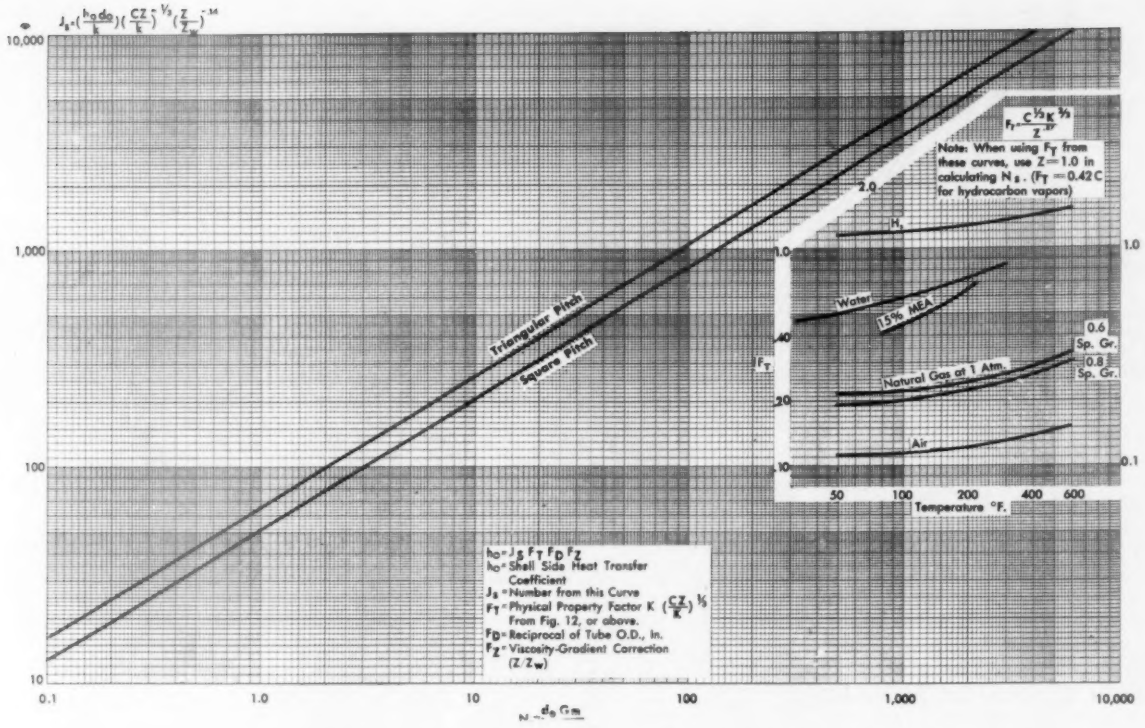
A specific heat of 2.2 is not shown in Fig. 13, but the parameter lines form a repeating cycle so a specific heat of 0.22 can be used and the result multiplied by 10.

$$h_o = 26.5 \times 10 \times 1.12$$

$$= 297 \text{ B.t.u./hr.-ft.}^2\text{-°F.}$$

This coefficient is based on outside surface.

Example 6: A 35° API, K = 11.8 crude is used to exchange heat with the diesel-fuel product from a fractionator. This crude enters at 230° F. and is heated to 290° F., flowing


Triangular Pitch
Square Pitch
Note: When using F_T from these curves, use Z=1.0 in calculating N_s. (F_T = 0.42 C for hydrocarbon vapors)
H_2
Water
15% MEA
Natural Gas at 1 Atm.
Air
0.6 Sp. Gr.
0.8 Sp. Gr.
Temperature °F.
$h_o = J_s F_T F_D F_Z$
h_o = Shell Side Heat Transfer Coefficient
J_s = Number from this Curve
F_T = Physical Property Factor K $(\frac{CZ}{k})^{1/3}$ From Fig. 12, or above.
F_D = Reciprocal of Tube O.D., In.
F_Z = Viscosity-Gradient Correction (Z/Z_w)

HEAT TRANSFER for fluid flowing across tube banks. Fig. 19.

through 1-in. 12-BWG tubes at the rate of 2,400 lb. per tube-hour. The diesel fuel is cooled from 500° to 260° F. What is the film coefficient of the crude oil in this exchanger?

Solution: It is necessary to estimate the viscosity of the oil at its average bulk temperature and at the wall temperature.

The average crude temperature is 260° F.

The average diesel-fuel temperature is 380° F.

If the film coefficients were equal and fouling was negligible, the wall temperature would be halfway between the two, or 320° F. The temperature at the inside surface of the tube-side fouling deposit will be less than this and a first guess of 300° F. will be used.

Bulk viscosity at 260° F. = 0.83 (from Fig. 9).

Wall viscosity at 300° F. = 0.65 (from Fig. 9).

The mass velocity is 2,400 × 0.04/0.479 = 200 lb./sec.-ft.²

The modified Reynolds' number:

$$N = \frac{0.782 \times 200}{0.83} = 188$$

The factor J from Fig. 11 is 1,270.

The factor F_T from Fig. 12 is 0.135.

The factor F_D for a 1-in. o.d. tube is 1.0.

The factor F_z is $(0.83/0.65)^{0.14}$ = 1.035.

$$h_o = 1{,}270 \times 0.135 \times 1 \times 1.035$$

$$= 177 \text{ B.t.u./hr.-ft.}^2\text{-°F.}$$

In order to check the first guess of 300° F. wall temperature, it would be necessary to assign fouling factors to both sides and calculate a diesel-fuel film coefficient. These data are not available for this problem, but judging by size of the factor F_z there would be little point in spending time in refining the first guess.

The value of h_o is based on outside surface.

Procedures for Tube-Side Pressure Drop

1. Get mass velocity in tubes:

$$G = \frac{W \times (144/3{,}600)}{A_t \times N} = \frac{0.04W}{A_t \times N}$$

where:

W = flow, lb./hr.

A_t = cross-sectional area of one tube, in.²

N = number tubes per pass.

2. From Fig. 16 get the correction factors A and B.

3. Determine tube-side pressure drop as:

$$\Delta P = f\,AL/\phi + BN$$

The factor A is used in getting the frictional pressure drop per foot of length. The factor B corrects for entrance and exit losses, return losses, etc. N is the number of passes while f is the friction factor from Fig. 15 and L is the total length of travel.

ϕ is the viscosity correction = $(Z/Z_W)^{0.14}$.

Example 7: The tubes in Example 6 are 16 ft. long and arranged in four tube passes per exchanger. There are two exchangers in series. Estimate the pressure drop of the crude flowing through the two exchangers.

Solution: Using the modified Reynolds' number of 188, the friction factor from Fig. 15 is 0.00275.

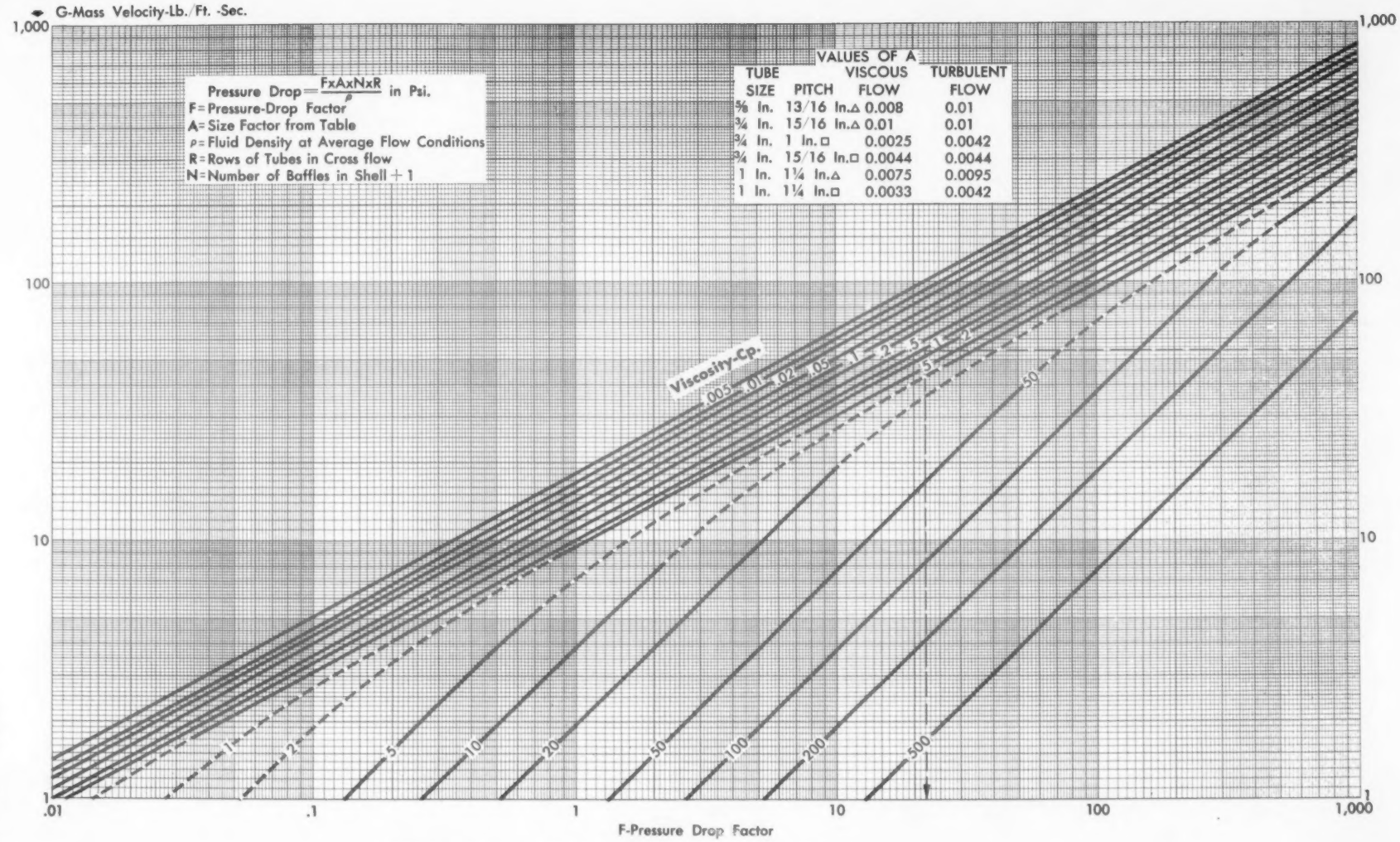
The specific gravity of a 35°-API oil at 260° F. is found in Nelson, Petroleum Refinery Engineering, 4th ed., p. 180, to be 0.77.

From Fig. 16 using a mass velocity of 200 and an inside diameter of 0.782, the factor A is 17 and B is 0.265.

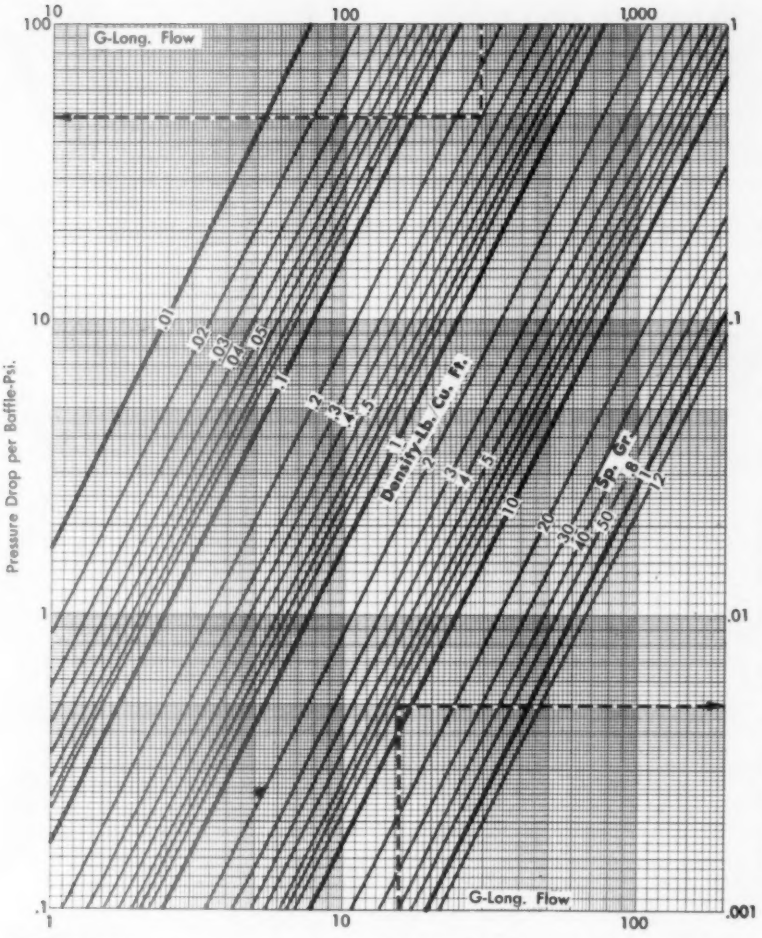
The total length of travel is 4 × 2 × 16 = 128 and the total number of passes is 4 × 2 = 8.

$$\Delta P = \frac{0.00275 \times 17 \times 128}{1.035}$$

$$+ 0.265 \times 8 = 7.90 \text{ psi.}$$



PRESSURE DROP in fluid flowing across tube banks. Fig. 20.



PRESSURE DROP in exchanger shell due to longitudinal flow. Fig. 21.

Method of Design—Shell Side

Shell-side transfer rate. The method used here is based on the equations proposed by Donohue[6,7] in which a crossflow mass velocity and a longitudinal mass velocity are determined, and the film coefficient is related to the geometric mean of the two.

Procedure for Shell-Side Film Coefficient

1. Determine G_x and G_1:

For crossflow $G_x = (0.04W/BM)$

where:

W = lb./hr.
B = baffle pitch or spacing, in.
M = net free distance (sum) of spaces between tubes from wall to wall at center of shell circle, in.

Note that minimum B is 2 in. or one-fifth shell i.d. and maximum is limited to 26 in. for ¾-in. tubes and 30 in. for 1-in. tubes (see TEMA).

Use the charts, Figs. 17 and 18. See also approximate equations for M, p. 557 in Nelson:[4]

$$G_1 = \frac{0.04W}{\pi/4\,(d_s^2 - N\,d_t^2)\,C}$$

where:

d_s = i.d. shell.
d_t = o.d. tube.
N = total number of tubes in bundle (Figs. 17 and 18).
C = baffle cut (expressed as per cent of shell area) and normally runs from 10 to 45%.

In the expression for G_1 above, the baffle cut is the window opening expressed as a fraction based on net free area.

2. Calculate the geometric mean mass velocity, G_m:

$$G_m = (G_x\,G_1)^{1/2}$$

3. Determine J_s from Fig. 19.

4. Determine F_T either from Fig. 12 for oils, or from Fig. 19. Note that if the F_T value is determined from Fig. 19, the value of Z to be used in calculating the modified Reynolds' number is **one** regardless of the actual value of viscosity.

5. Determine F_D as the reciprocal of the tube outside diameter, and F_Z as the viscosity ratio to the 0.14 power.

6. Calculate the film coefficient:

$$h_o = J_s\,F_T\,F_D\,F_Z$$

Example 8: A cooler handles 40,000 lb. per hour of 42° API, K = 12.0 kerosine at 400° F. cools it to 100° F. This is done in the shell side of a 17¼-in.-i.d. by 16-ft. exchanger with 228 tubes of ¾-in., 14-BWG on 1⅛-in. triangular pitch. The shell has a ⅜-in. wall thickness. There are 42 baffles spaced 4 in. apart with a 10% window cut in each one. Calculate the film coefficient for the kerosine. The viscosity-gradient term may be neglected.

Solution: The tube layout table, Fig. 17, gives the net free distance as 6.2.

The crossflow mass velocity is:

$$G_x = (40{,}000 \times 0.04)/(6.2 \times 4)$$

$$64.5 \text{ lb./sec.-sq. ft.}$$

The longitudinal mass velocity is:

$$G_1 = \frac{40{,}000 \times 0.04}{0.785 \times [17.25^2 - 22.8\,(0.75)^2] \times 0.10} = 121 \text{ lb./sec.-sq. ft.}$$

The geometric mean mass velocity is:

$$G_m = (64.5 \times 121)^{1/2} = 88.5$$

The viscosity at the average temperature is estimated to be 0.6 cp.

The modified shell-side Reynolds' number is:

$$N_s = (0.75 \times 88.5)/0.6 = 111$$

From Fig. 19, J_s = 1,100.
From Fig. 12, F_T = 0.125.

$$F_D = 1/0.75 = 1.33$$

$$F_Z = 1.0$$

$$h_o = 1{,}100 \times 0.125 \times 1.33 \times 1$$

$$= 183 \text{ B.t.u./hr.-sq. ft.}$$

Procedure for Shell-Side Pressure Drop

1. Find ΔP_1—treat as flow through orifice. Use the chart, Fig. 21.

2. Find ΔP_x—use Fig. 20 to get factor F in equation.

$$\Delta P_x = \frac{F A N R}{\rho}$$

where:

F = pressure-drop factor.
A = size factor from table (insert in Fig. 20).
R = rows of tubes in crossflow from Figs. 17 or 18, multiplied by (1 − fraction cut).
ρ = density of fluid at average flow conditions.

Example 9: Estimate the pressure drop in the shell of Example 7.

Solution: Using a crossflow mass velocity of 64.5 and a viscosity of 0.6, Fig. 20 gives F = 27.

The number of baffle spaces is 42 + 1 = 43.

The value of A for ¾-in. by 15/16-in. triangular pitch, turbulent flow is 0.0044.

The number of rows to cross is found in the tube layout table as 31 but only 90% will be crossed each time.

$$R = 31 \times 0.9 = 28$$

The density of kerosine at 250° F. is 0.74 × 62.4 = 46.1 lb. per cu. ft.

The crossflow pressure drop:

$$\Delta P_x = 27 \times 0.0044 \times 43 \times 28.0/46.1 = 3.10 \text{ psi.}$$

Using a longitudinal mass velocity of 121 and a density of 46.1 the longitudinal pressure drop per baffle is found from Fig. 21 as 0.055 psi.

$$\Delta P_1 = 42 \times 0.055 = 2.3 \text{ psi.}$$

The total pressure drop is 3.10 + 2.3 = 5.4 psi.

Summary of Method

The method outlined here ordinarily gives conservative results. Recently work has been done at University of Delaware on the effect of leakage and the relative weighting of crossflow and longitudinal flow. The Wolverine data book[3] uses a method involving only the crossflow mass velocity, but with parameter of various per cent cut. Further studies presently being conducted may make it possible in the future to adopt a less conservative method than the one presented here.

Acknowledgment

The aid of E. W. Flaxbart, chief engineer, heat-exchanger division, Western Supply Co., in the preparation of this article is gratefully acknowledged.

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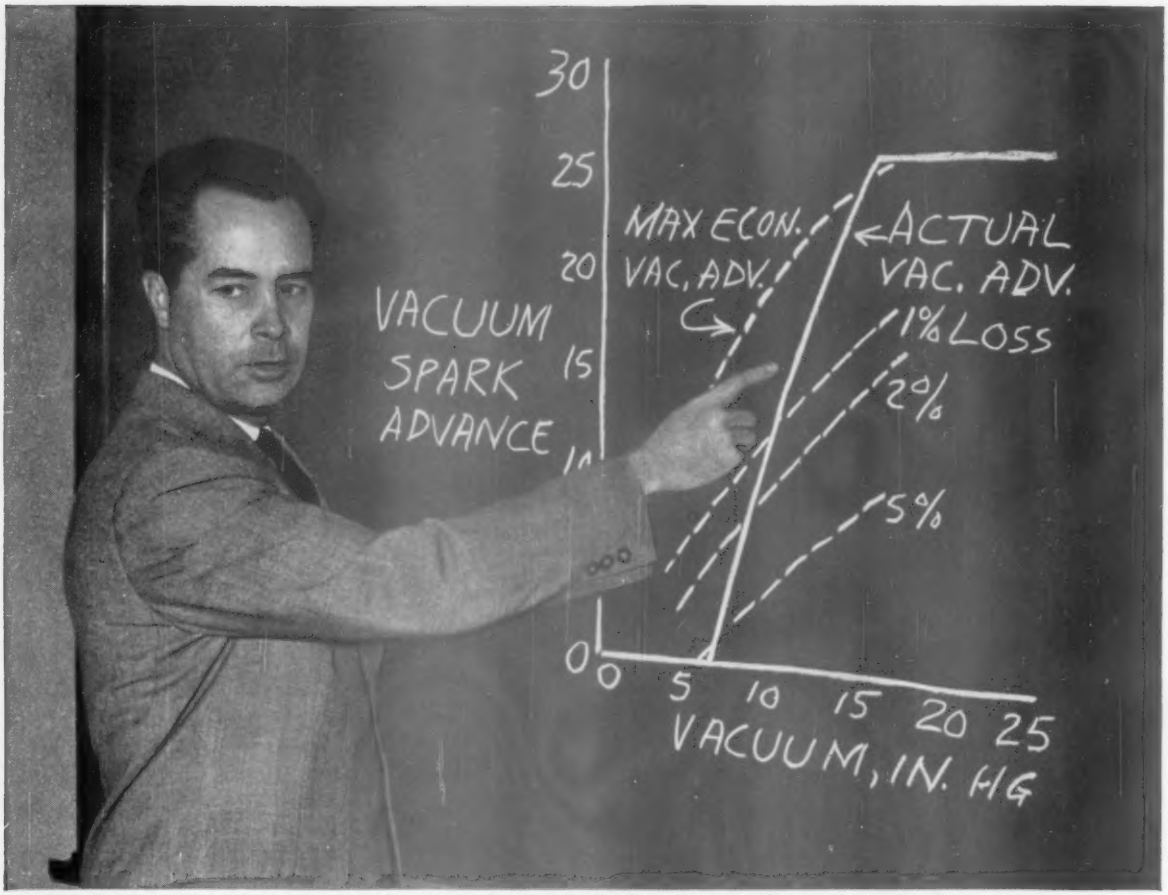


Ethyl staff engineer Harry Toulmin explains how the engine designer develops a compromise vacuum spark advance curve.

Ethyl Research Studies Part-Throttle Knock

What causes it. How to control it.

DURING the past several years, knocking complaints have been recorded for certain premium-fuel-requirement passenger cars at part-throttle as well as full-throttle conditions.

Part-throttle knocking generally occurs at a point between full-throttle and road load, usually at low engine speed and from 8 to 14 inches manifold vacuum. Studies have shown that these conditions are frequently duplicated by the average motorist when operating his car in city traffic at low engine speeds.

Fuel Quality can control Part-Throttle Knock

When the problem of part-throttle knock becomes apparent in a particular car series through customer complaint, the difficulty can be relieved by increasing the Motor octane of the fuel or by adjusting the basic spark advance of the vehicle. A change in fuel quality would be more desirable since this retains top engine performance and maximum fuel economy.

What causes Part-Throttle Knock?

When the engine designer develops a new passenger car engine, a number of compromises are made to obtain optimum performance and durability for a given cost, weight and fuel requirement. One compromise is in the ignition advance curve. The full-throttle advance curve is usually retarded from maximum power by 1 or 2 percent in the mid-speed range.

This yields optimum engine power for a given octane requirement. By taking this small initial power loss, the octane requirement is reduced sharply—2.5 to 4 octane numbers. This establishes a full-throttle requirement for the engine.

To improve fuel economy at road load and between road load and full throttle, a vacuum advance unit is usually added to the distributor. This provides additional spark advance which adds to centrifugal advance at light engine loads. The spark advance curve cannot be set for optimum economy across the entire part-throttle

range without increasing requirement excessively. So a compromise curve is used which gives the best economy without part-throttle knocking problems on typical motor fuels. If not enough compromise is made, the vehicle will be part-throttle knock limited.

Octane number requirement for such a vehicle is shown in the figure to the right. With sensitive reference fuel, octane requirement peaks at manifold vacuum of about 12″—and is a number higher than at full throttle. This is due to severe depreciation of sensitive fuels (those having large differences between Research and Motor octane) at light loads. Under these conditions, carburetor mixtures are leaner, mixture temperatures higher and exhaust gas dilution is greater—all of which contribute to the depreciation of the sensitive fuel.

Motor Octane is the Key

Since low sensitivity fuels are depreciated less than high sensitivity fuels, the part-throttle knocking problem is relieved by increasing the Motor octane number. This was substantiated recently in the Ethyl 1959 Premium Gasoline Antiknock Behavior study.

Road antiknock performance data were obtained on 30 premium fuels in five 1959 passenger cars. In addition, data were obtained in seven cars on two special sets of fuels, one with constant Research octane number and one with constant Motor octane number.

Both of these studies indicated that the most important fuel factor in controlling part-throttle knock is Motor octane number. In the low-speed range where most part-throttle knock occurs, Motor octane number has effectiveness of approximately unity, but Research octane has little or no effect on road octane number.

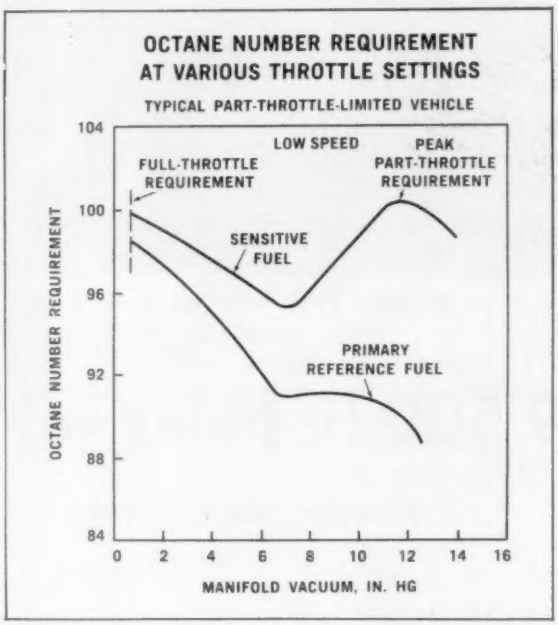
Fuel hydrocarbon composition has very little effect on road performance at low speed. In the high speed range (3000 rpm) an increase in Motor octane number of one unit will increase the road rating by two units, while an increase in Research octane number will actually decrease the road rating. At 3000 rpm an increase in aromatic content and a decrease in olefin content will increase the part-throttle road rating of a fuel.

Control by Engine Adjustment— A loss in economy

An obvious way to correct part-throttle knock is to reduce the spark advance at part throttle. This defeats the original purpose of the manufacturer since it reduces operating economy in this driving range.

A recent study showed that approximately 40 percent of the tank fuel is consumed in the 5″ to 15″ manifold vacuum range under some commuter driving conditions.

Further, a reduction of part-throttle spark advance can change the part-throttle response (acceleration) of a car, causing flat spots. This, in turn, can be corrected by enriching the mixture—a further loss of economy.



How Ethyl Research can help you

For a detailed discussion of part-throttle knock, ask your Ethyl Representative for copies of the Ethyl research paper, "Part-Throttle Knock," presented at the SAE National Fuels and Lubricants Meeting in Chicago, October 28-30, 1959.

Additional information on the subject of part-throttle knock can also be found in the Ethyl report entitled, "1959 Premium Gasoline Antiknock Behavior." Your Ethyl Representative will be glad to supply you with copies, or arrange for a presentation of this major project by an Ethyl Refinery Technologist.

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BY USING 2⅞-IN. DRILL PIPE instead of 3½ or 4-in., Woolf & Magee has been able to drill . . .

9,500-ft. holes with 5,000-ft. rig

Contractor makes turnkey slim holes routine in Mississippi drilling

By Ed McGhee
Drilling Editor

THE SPECIALIZED experience of one drilling contractor is enabling it to keep three of its rigs busy.

Woolf & Magee, Inc., of Tyler, Tex., and Shreveport, La., is making turnkey contracts to drill slim holes in western Mississippi and eastern Louisiana. The firm is working for major producers and independents alike, and the result has been cheaper wells for both classes of operators and relatively steady work for the contractor's equipment.

Woolf & Magee has other rigs doing more conventional work in East Texas, North Louisiana, and nearby areas. But with its three slim-hole rigs it has found in turnkey contracts a means to secure more work than would likely be available otherwise.

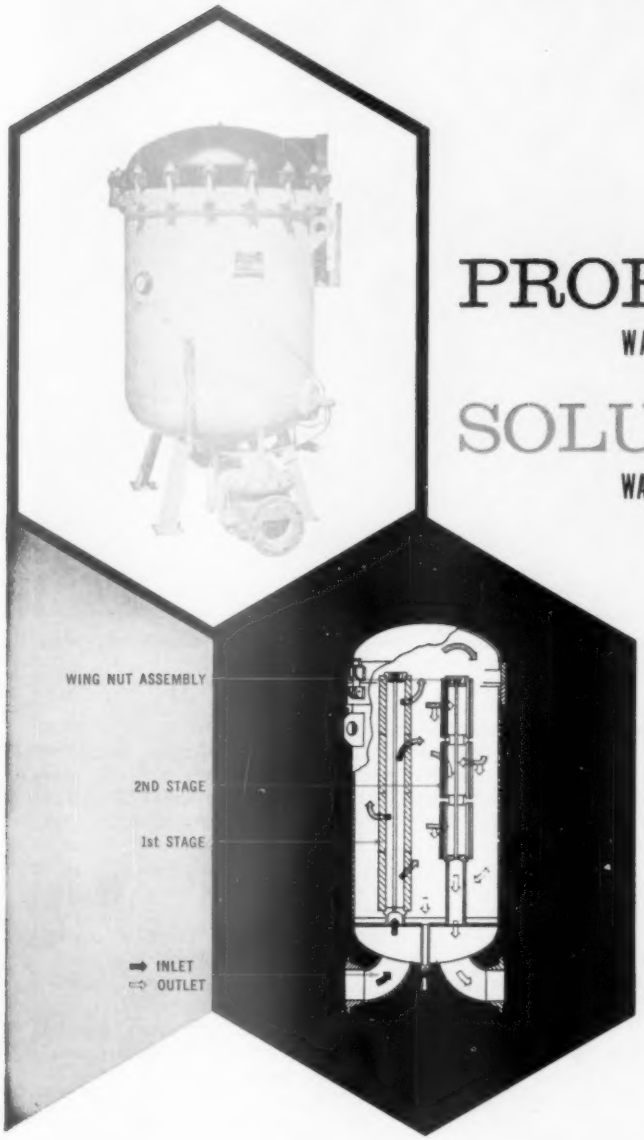
For several years, Woolf & Magee had drilled slim holes on footage and turnkey basis; this work was reported in a Journal article of September 26, 1955, by James W. Arnold, the firm's vice president. Most of the wells had been in western Mississippi and eastern Louisiana with a lesser number in Alabama, East Texas, and southern Arkansas. In the course of this work, the company learned the equipment needed to make a success of the small hole sizes in these areas. As many of the holes were for small independents, Woolf & Magee personnel were given the opportunity to gain experience in supervising those operations normally overseen by the oil companies' representatives.

The firm has found itself drilling not only for small independents but also for some of the nation's largest producers who had let few, if any, turnkey contracts before.

Where savings arise. Traditionally, the great majority of turnkey contracts have been let by the operators too small to maintain a staff which could properly supervise a footage contract. These little firms often retain consultants to oversee drilling. However, by letting a turnkey contract to a responsible contractor, the small operator can save himself even the cost of the consultant.

Another thing about turnkey contracts that appeals to the small producer is the fact that he knows beforehand what the total cost of the well will be. There are no open-end expenses. This fact has budget appeal also for large operators even though they have plenty of qualified personnel to supervise contract drilling.

Another advantage that the turnkey slim holes offer to the big producers is that of eliminating much of their overhead cost on wells. One company, for instance, on a regular drilling contract, has a policy of mak-



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PORTABILITY is part of key to efficiency of operations. Wheel-mounted draw-works unit and other unitized packages make it possible to rig down, move, and rig up on new location with a minimum of lost motion.

ing all-weather roads into every location. On a turnkey contract, the contractor doesn't improve the road at all unless it's necessary to get into or out of the location, and if sufficient time is allowed, contractor may be able to watch local weather. He can then move when there is a minimum of road and location work to be done.

Moreover, the company is spared the expense of supervisor's time charged against the well.

On top of these savings is the inherent low cost of a slim hole drilled by a small, specially designed rig.

What contractor provides. In most of Woolf & Magee's turnkey wells, the operator furnishes little more than the location stake. The contractor builds roads, if necessary; prepares location; provides fuel and water; buys, runs, and cements surface casing; provides and supervises the mud; drills to total depth; runs the basic logs; takes sidewall samples; and plugs the well if it is a dry hole; sometimes up to 50 ft. of core is cut.

Total depth on most wells has been between 5,000 and 8,000 ft. with the deep holes either 5⅝ or 6⅛-in. diameter. Thus, surface pipe is usually between 7 and 8⅝ in. and no intermediate casing is required.

Mud is only lightly treated, total bill seldom exceeding $500, except on the deeper wells. Essentially, the mud is gel-chemical, using clay, SAPP, Q-Broxin, and CMC. Any necessary supervision of the mud system is done by the tool pushers.

To complete as producer. In the early days of its slim-hole work, Woolf & Magee was usually requested by the operators to ream the hole larger (to 7⅞ in.) if production were found. This allowed 5½-in. oil string to be run. At the time, many tools were not available in sizes for running inside smaller pipe.

Now the operators sometimes run 2½-in. tubing as oil string in the slim holes. Of course this pipe is cheaper than larger pipe and no reaming is necessary. Moreover, as a result of tubingless-completion work, most completion and production tools can be had in sizes small enough to run in 2½-in.

On several occasions the company successfully ran 4½-in. casing in a 6⅛-in. hole; either 3½ or 4-in. casing has been run in 6⅛-in. hole. And 2⅞-in. casing is used in the 5⅝-in. hole.

The rigs. Woolf & Magee's Rigs 10, 11, and 12, have been engaged in the slim-hole work. All are mounted on triple-axle trailers with 94-ft. cantilever masts. The drilling engine on each drives through a torque converter and rotary drive is off the draw works. A rig crew contains four men.

Pumps are independently driven by an engine mounted directly on the pump skids. Several pumps have been used on the rigs including a new plunger type as well as more conventional Bethlehem 7¼ by 12's.

The rigs carry only one pump each. However, this has presented no problem; very often little mud is mixed, and hole conditions seldom require a standby pump.

Ordinarily, these rigs would be classed as capable of 4,500 to 5,000-ft. work with 4½-in. drill pipe. However, Rig 11 has drilled a well to 10,020 ft. using 2⅞-in. drill tubing. Even at this depth, a round trip could be made in only 5½ to 6½ hours.

The complete rig with drill pipe can make field moves in good weather in as few as eight truckloads. Long-distance highway moves require only 10 to 12 loads. Further, it is not uncommon for the rig to tear down, move, rig up, and spud in a new well in 12 hours on field moves under good conditions.

Drill pipe is 2⅞-in. EUE N-80 pipe weighing 6.5 lb. per ft. and fitted with tool joints. The rigs pull doubles.

CAREFULLY CALCULATED HYDRAULICS keep drilling rate at its maximum. This skid-mounted 7½-by-12-in. pump and engine furnish enough fluid to keep jet velocity above 200 ft. per second. Annular velocity in the small holes is more than 200 ft. per minute.

Drilling practice. Average drill-collar string is about twelve 5-in. collars or twelve to fourteen 4¼-in. collars, in a 6⅛-in. hole. Additional collars are used when drilling conditions demand.

Rotary speed usually starts at about 150 r.p.m. out from below the surface pipe and slows back to about 80 r.p.m. in the deep hole. Weight on bit varies up to 12,000 lb., all of which is collar weight; weights of 20,000 lb. have been used where needed. Only rarely has hole deviation exceeded 2° under these conditions.

The company uses jet bits exclusively in the small hole. The program usually starts with three 5/16-in. jets with 800 psi. on the surface. As the hole deepens, surface pressure rises to 1,100 to 1,200 psi. This keeps annular velocity above 140 ft. per minute and jet velocities above 200 ft. per second through most of the hole.

An average 7,500-ft. well might require 11 days and eight bits.

In case of trouble. In any turnkey operation, of course, the contractor assumes more risk than he would under other forms of contracts. Thus, in its turnkey jobs, Woolf & Magee runs the risk of losing everything it invests in a hole before reaching contract depth. And, of course, there have been wells on which the firm lost money because of unexpected trouble. But there have been enough wells drilled in routine fashion to make up for the money losers.

Fishing has seldom been a problem. Usually, spotting oil around the pipe and working it frees the string. Only on two occasions has it been necessary to fish for the collars in the small hole. On one occasion, a tapered tap brought the fish to the surface. Another time it was necessary to resort to reaming the hole to a larger size (7⅞-in.) and then washing over the fish.

Some representative wells. A recent turnkeyed well in Pistol Ridge field of Mississippi shows how an average well might be drilled.

Seven-inch surface pipe was set to 1,000 ft. in 9⅞ in. hole. Then, a 5⅝-in. hole was drilled to 9,100 ft. in 20 days. Logs and sidewall cores were taken and an oil string of 2⅞-in. tubing was cemented on bottom.

Mud bill in this particular well was about $1,300; average in the field for larger wells is $2,000 to $2,500.

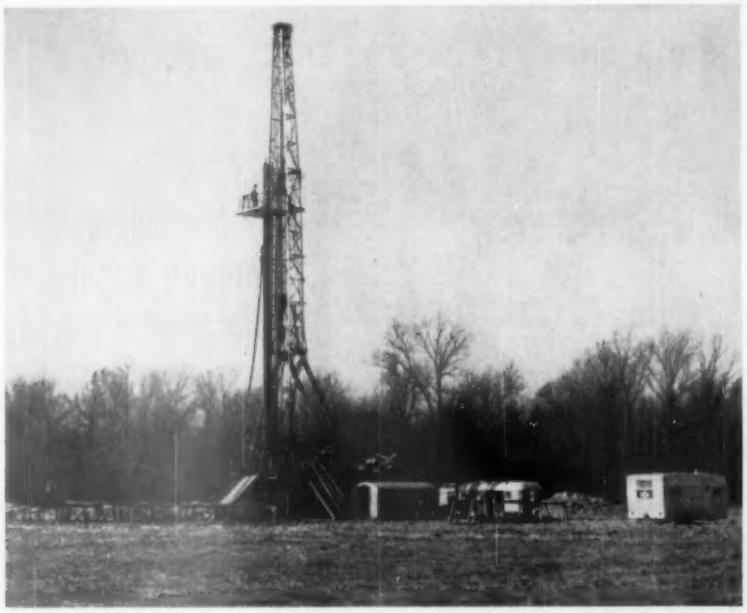
After the casing had been set and tested, the rig was released. The operator completed the well with wire line.

Another turnkey job was a wildcat in Sharkey County, Mississippi. Surface pipe of a 8⅝-in. casing was set at 848 ft. Then the deep hole was drilled with a 6⅛-in. bit, reaching total depth of 8,685 ft. in 23 net days with 28 bits. The hole proved dry and was plugged.

One of the rigs left its usual territory to turnkey a well in Cameron Parish, Louisiana. The operator wanted a fast evaluation of an expiring lease block and contracted for a hole to 8,000 ft. At that depth, the operator wasn't satisfied with the formations already uncovered and wanted a look at deeper zones.

So, the rig continued drilling its 5⅝-in. hole on day work down to the total depth of 9,960 ft. The well was dry and abandoned.

In 283 slim holes, representing hole sizes from 4¾ to 6¾-in., 56 wells were in the range of 7,000 to 10,000 ft. Average depth for all 283 holes was 5,800 ft.



SLIM HOLER on location in Sharkey County, Mississippi. Efficient operations and slim-hole methods have enabled this contractor to offer an economical turnkey package.

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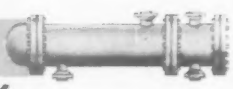

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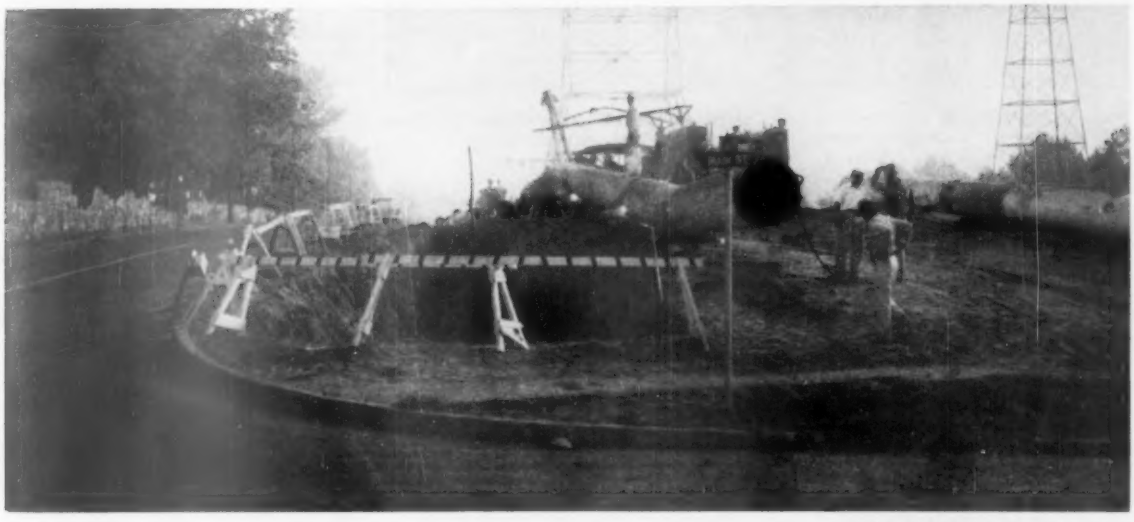
WALLOWING in deep mud the 300-amp. welding machines are towed along the firing line.

Swampy country and



FOR 16½ MILES the big loop was laid on the cramped right-of-way of a major power company.

city congestion combated

. . . in building Transco 36-in. loop

BY PAUL REED
Pipeline Editor

LARGEST-SIZE tractors in an extra-large spread of H. C. Price Co. laid thick-wall 36-in. pipe with heavy Somastic coating for the recently completed 39½-mile loop of Transcontinental Gas Pipe Line Corp. in New Jersey. Work was carried on under the tough conditions of a right-of-way through country interspersed with numerous swamps which also penetrated into metropolitan areas near Newark.

At times the spread had to traverse backfill spread out on the working side of the right-of-way. In one place the spread worked on a narrow road along a levee specially built through a swamp. For a long stretch it went between the poles of electric-power-transmission lines. Then there were the problems of shooting rock close to buildings. However, though the conditions were unusual, the methods were not unusual. Mechanized equipment was used all the way.

NEAR WHIPPANY, N. J., on the outskirts of Newark, a boring machine in a ditch full of water drills under a railroad for installing 42-in. casing.

Two of the large Price spreads were combined to form a double-size spread directed by C. E. Shivel and W. H. (Blondie) Olrich. There were three safety engineers on the job.

For a while there were two pipe gangs. One of them was a small gang working ahead of the main pipe gang. This small gang had one tractor, two stringer-bead welders, and three hot-pass welders. When the main pipe gang caught up with the small pipe gang, the latter skipped ahead for a fresh start. At times the use of two pipe gangs made it possible to increase the output of the whole spread by 1,500 ft. daily. Rains finally stopped the use of the small pipe gang.

Welding in the pipe gang of the main spread was done by three stringer-bead welders and four hot-pass welders. For 2 or 3 weeks, there was a maximum of 45 welders in the firing line.

All welders used 300-amp. machines with the exception of tie-in and utility welders who used 200-amp. machines.

The 29½-mile 36-in. project contracted by Price is part of a 50-mile 36-in. Transco loop. The remaining 9½ miles at the northeast end was laid by J. P. Neill & Co. The Price section runs in an area between Somerville and Caldwell, N. J.

Pipe includes 6,000 ft. with ⅝-in. wall, and the remainder with ½-in. wall. The ⅝-in. pipe was laid in congested areas where the line ran close to houses, factories, and a college. Casing at road crossings is of 42-in. diameter.

The entire loop had an outside coating of Somastic and an inside plastic coating. At the seven rivers and other submerged areas, the pipe had a Hevicote concrete jacket. All coating and jacketing was done at H. C. Price Co.'s permanent plant at Philadelphia.

Ditch was 44 in. wide, Pipe has a 36-in. cover.

Altogether there was a total of 3½ miles of swamp along the line, in patches varying from several hundred feet to 1½ miles. The usual practice was to pull the pipe at swamps and rivers.

Special levee road . . . A 15,000-ft. road on a levee was built where the cost of riprapping would have been very high. At this section, the pipeline company built a gravel road 18 ft. wide on a specially made levee. Pipe was laid beside the road on a shoulder of the levee, well above the level of the swamp. This was the tightest spot on the job, for vehicles could not pass on the narrow road.

Piles were driven in swampy ground to support meter settings.

Ditch through areas of high water levels was dewatered by the sand point method. In some places the ditch was shored to prevent caving.

For 16½ miles—approximately 40% of the Price section—pipe was laid along right-of-way of Public Service Co. of New Jersey, running from swampy ground into the metropolitan area near Newark.

In places the line ran between two rows of poles. Where the ditch had to be dug close to poles, special provision had to be made for the poles to be braced to keep them from falling into the ditch. Bracing was done by a slanting support fastened to the lower part of the pole and driven into the ground. Some of these slanting supports were stiffened by timber blocks placed so as to exert pressure at the point where the slanting support connected with the pole.

Backfill on working side . . . For 10 miles on the Public Service right-of-way, it was necessary to spread the backfill on the working side of the ditch because there was insufficient space for the spoil bank between the ditch and the nearest boundary of the right-of-way.

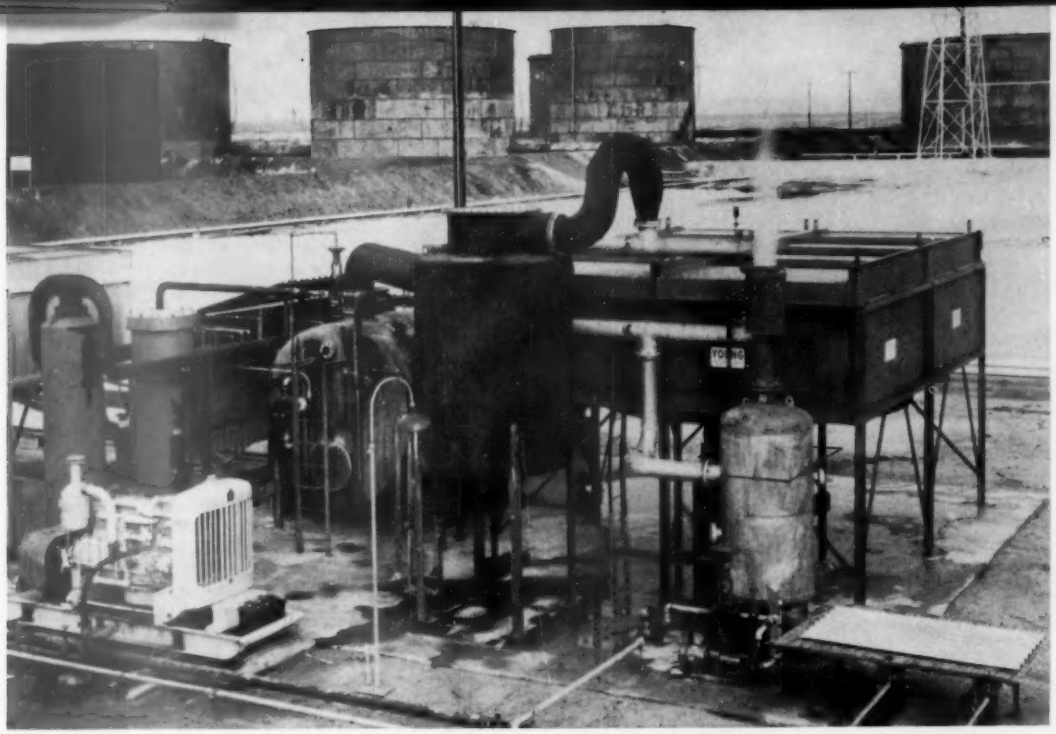
Backfill was spread with a thickness of 1 ft. for a width of about 20 ft. on the working side. This had to be covered with a corduroy road made of riprapping because of mud during wet weather.

Only 4 ft. was allowed between the ditch and the boundary of the right-of-way. This cramped situation occurred because of the requirements of a plan for maximum use of the right-of-way for future pipelines. Thus the Transco loop was located close to the right-of-way boundary.

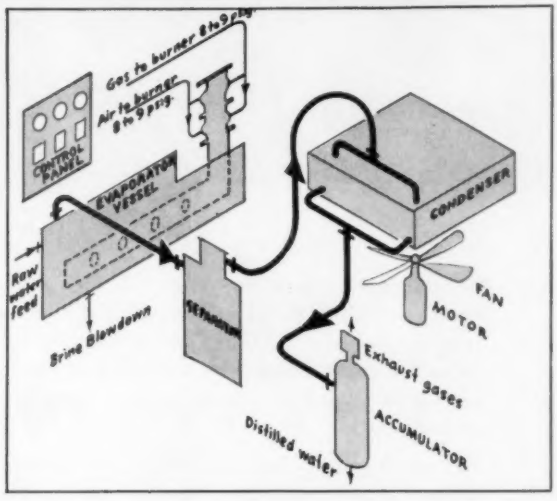
Shooting . . . In congested areas, shooting was sometimes done as close as 10 ft. to houses. Intensity of explosions was reduced by connectors for separating the timing of blasting shots. Mats prevented damage from flying rocks. Nearby houses were surveyed before and after shooting.

Where the pipeline crossed under power, sewer, and water lines in rocky ground, shooting was a fussy job. No damage occurred at these points. Sometimes the pipeline had to go as deep as 16 ft. to cross under other lines.

At one road crossing, tunneling had to go through 14 ft. of solid rock.



FRESH WATER is produced at the Wafra gathering station of the American Independent Oil Co., Kuwait-Saudi Arabia Neutral Zone, by this 25,000-gal. per day submerged-combustion distillation plant. Flow plan for the unit is shown at right, Fig. 1.



New distillation plant produces fresh water at low cost

Large volumes of distilled water can be produced at low cost at oil installations where local water supply is unfit for drinking or process use. A new-type distillation plant, which depends on low-cost, readily available gas, uses a submerged gas burner to generate steam directly from brackish or sea water. The steam is condensed to provide a source of pure water for any required use.

THE NEED for new distillation plants can be illustrated by the desert field operations of an oil company in the Persian Gulf area. The only source of water was a limited supply of brackish well water with the approximate composition shown in Table 1. There was not enough water available to operate a flash evaporator or multiple-effect plant. And the water scaled so badly that thermocompression plants which operated normally on Persian Gulf water on the coast became completely inoperative after 1 or 2 days' operation in this desert area, due to scale plugging of tubes. It was necessary to haul fresh water about 50 miles to the operating area.

Design basis . . . The new type of water plant was designed not only to take advantage of the availability of free natural gas being flared in the oil-producing operations but to operate on a minimum of feed water and overcome the bad scaling problem. The essential features of the new plant are shown in Fig. 1. Air and gas at pressures of 8 to 10 psig. are fed to a submerged burner installed in a steel vessel partially filled with water.

The direct transfer of heat from the hot combustion gas generates steam directly and eliminates troublesome scale formation. The mixture of steam and combustion gas is then cooled to condense the steam and the product water is sent to storage. An air condenser is used, but where sufficient

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raw water is available it can be used in the cooling process.

Due to absorption by the water of carbon dioxide from the combustion gas, the product water has a pH of approximately 5.9. This is adjusted to a pH of 8.5 by injection of dilute sodium hydroxide solution. The final product water has a total solids content of about 100 p.p.m. It would be easy to install a small ion exchanger to achieve water of 1 or 2 p.p.m.-or-less solids, but the product water in this instance has been highly satisfactory for all oil-field and camp operations.

The initial plant was designed for 10,000 gal. water production per day. As the water needs increased due to expansion of oil-field operations a second plant of 25,000 gal. per day capacity was installed. These plants have been running almost continuously for over 6 months with short shutdowns lasting 1 to 2 hours every 8 to 10 days to change the oil and service the small gas engine driving the air compressors.

During these brief shutdown periods calcium sulfate scale which has collected in chunks on the bottom of the evaporator vessel is scooped out through the evaporator vessel manway. This scale is formed on the surface of the burner tube due to the localized high temperature and the very high calcium sulfate content of the feed water. After building up to a thickness of about ⅛ in., the scale pops off the burner tube and falls to

TABLE 1—WELL-WATER ANALYSIS

Physical appearance:	Hazy, sulfurous smell, with black sediment
Specific gravity @ 60° F.:	1.016
Total dissolved solids:	22,700 p.p.m.
pH:	6.8

Component	Parts per million
Na^+	5,233
Mg^{++}	446
Ca^{++}	1,744
Cl^-	10,820
$SO_4^=$	2,022
HCO_3^-	244
	20,509

Hypothetical combination of components	
$Ca(HCO_3)_2$	324
$CaSO_4$	2,864
$CaCl_2$	2,271
$MgCl_2$	1,747
$NaCl$	13,297
	20,503

NEW DISTILLATION PLANT
starts on page 93

the bottom. No operating trouble has been experienced due to this scale as it does not interfere with the process in any way.

Advantages . . . The operating experience gained on the two plants has shown:

A submerged-combustion water plant can operate successfully on almost any kind of raw-water supply.

Between 50 and 75% of the feed water to the unit will be converted to distilled water. This is of special importance in desert operations where even brackish well water is frequently limited in supply.

The plants have performed as designed in an area where no other available commercial unit would operate at all.

The water product is of extremely good quality and is usable in all field operations.

The scaling problem normal to most water-distillation plants has been eliminated.

The plants will run on almost any gas fuel available so long as the composition is known for the burner design. If the gas composition changes, a new low-cost burner plate designed for the new conditions can be installed in the burner. The gas can contain small amounts of H_2S, but if large amounts of H_2S are present it is best to remove it or design the plant and the alkaline injection in order to allow for SO_2 absorption in the product water.

No steam supply is required.

The total initial installed cost for these units is almost identical to other types of water-distillation units.

Operating and maintenance cost is very low since even in small sizes the operation is almost completely automatic. The plants are designed for push-button starting from a central control panel mounted near the evaporator vessel. In case the feed water or gas supply is shut off the plant automatically shuts down. The plants have run unattended 16 hours each day and are checked during the day shift by a mechanic operator to see that all plant components are in good running condition.

There is no safety hazard in the plant due to high pressures or temperatures. Operating pressure in the plant vessels is never over 5 psig. and the maximum temperature is 205° F.

There is no vacuum in any part of the plant.

All plant components are of standard steel or aluminum fabrication except for the Submerged Combustion

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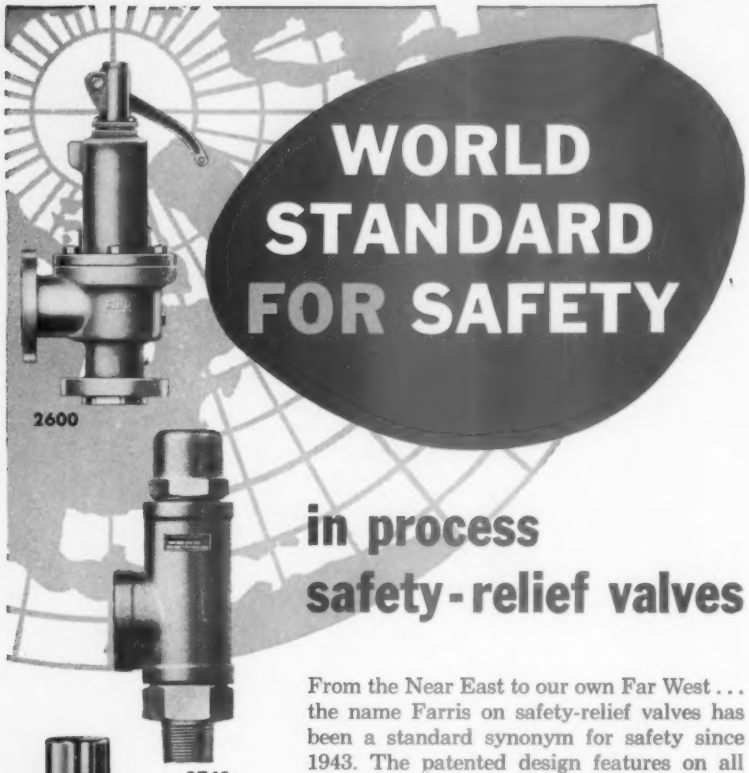

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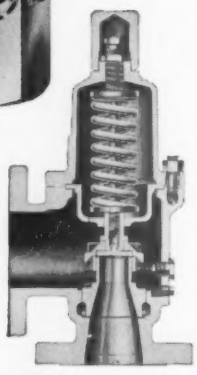

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NEW DISTILLATION PLANT
starts on page 93

Co. burner and the small feed-water and product-water pumps.

Disadvantages . . . There are two main disadvantages to a submerged-combustion distillation plant for general use. These are:

The plant must have gas fuel, although propane or butane are satisfactory.

The plant has only single-effect efficiency which will give a high fuel cost where gas is expensive. This can be overcome to a large degree by using the evaporator vessel as a water heater to a staged flash evaporator, thus eliminating the usual steam supply and steam-heater chest required on such units.

Since scaling in the steam-heater chest is one of the worst operating problems on a flash evaporator the submerged-combustion burner will eliminate this as well as giving water temperatures well over the present 170° F. maximum for flash evaporators if desired.

The over-all plant design for both operating water plants was handled by Carroll E. Bradberry & Associates, of Los Altos, Calif., for the American Independent Oil Co.'s Kuwait-Saudi Arabia-Neutral Zone operations. Detailed design on the submerged burners with the necessary starting and safety controls was handled by the plant equipment supplier, Submerged Combustion, Inc., of Hammond, Ind. Patents are pending on the plant.

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Pressure principles aid refinery work

The pressure at a point in a fluid is exerted equally in all directions. This principle can best be illustrated if you will recall the shape a balloon takes when it is blown up or filled with water. Because of this fact, hydraulic systems can actuate valves and the brakes of your car, and fluids can be pumped from one place in the refinery to another.

BECAUSE gases respond so readily to different temperatures and because they have the property of compressibility it is possible to use them to advantage in the refining industry. Air is stored in vessels for use in air drills, air hammers, and pumps. Nitrogen, oxygen, and many other gases are stored in drums and later transported in cylinders to consumers.

Steam is generated and is held under pressure to be used in steam engines, steam pumps, and steam turbines. High-pressure burner-line gas is moved from its source to the point of use through pipelines by pressurizing and transporting it under pressure.

To study some of the principles governing the behavior of gases, suppose we use the most common gas known—air. Air is so common that we rarely think of it as being a gas or even as having weight or volume, yet we know that a vessel or a pipeline cannot be filled with a liquid unless the air is allowed to get out. It can be demonstrated by weighing an empty can, then pumping air into it and sealing it, that air does have weight.

Since air does have weight it builds up static pressure much the same as do liquids. One cubic foot of air weighs about 0.08 lb. A room 10 ft. wide, 20 ft. long, and 8 ft. high has 1,600 cu. ft. of air in it weighing about 128 lb. The deep layer of air which blankets the earth exerts a pressure much like the water pressure at the bottom of the ocean. This pressure is known as atmospheric pressure and is about 14.7 psi. at sea level.

At higher elevations the atmospheric pressure is less than 14.7 psi. In fact for every 1,000 ft. of elevation the pressure falls off a little more than ½ psi. (0.55). We do not notice or feel this 14.7 psi. on our bodies because pressure is exerted in all directions and the pressure inside our body is the same as the pressure outside and we only notice a difference in pressure (when driving up a mountain rapidly our ears "pop").

Gage pressure . . . In process work we are usually interested in how much more pressure there is than atmospheric. Therefore, most refinery pressure gages are calibrated so that "0" on the gage is atmospheric pressure. On this type of gage, a reading is therefore called pounds per square inch gage (psig.). There are some gages, however, where atmospheric pressure is shown as 14.7 psi. A reading on this type of gage is called pounds per square inch absolute (psia.); 10 psia. is therefore 4.7 psi. less than atmospheric pressure.

Vacuum . . . When a pressure is less than atmospheric pressure it is called a vacuum. A vacuum is a lack of air or fluid. Long ago it was proved that air could be almost completely withdrawn from a vessel, creating a vacuum. It is impossible to pump absolutely all the air out of a container and thus make a perfect vacuum (0 psia.), but enough air can be pumped out to be effective.

At first, vacuum pumps were found only in laboratories. Then it was found that the principle of the vacuum could be used elsewhere. Electric light bulbs and X-ray bulbs are made with a vacuum which makes them more efficient. A vacuum is used on the condensers of our steam turbines, in our distillation processes, and in our refrigeration processes. A gasoline engine gets its charge by pulling a vacuum on the carburetor, thus filling the cylinders with an explosive mixture of gas and air.

Since we have found that air has weight and rushes into any available space, we know it exerts pressure. Like water, it exerts as much pressure upward as downward and to all sides, and we do not notice it. A German demonstrated this fact when he made a pair of half spheres 22-in. in diameter. He ground them together and pumped out the air to as nearly a complete vacuum as possible. It took eight horses to pull them apart. This proves that the atmosphere exerts an immense amount of pressure.

There are many means of achieving a vacuum. If a distillation tower, for example, is filled with water all the air is displaced. If draining of the tower is then started without opening a vent at the top, a vacuum will be created with possible serious damage to the equipment since atmospheric pressure at 14.7 psi. is being exerted on the outside of the tower.

Another means for creating a vacuum is through the displacement of air, hydrogen, or inert gas with a condensable fluid such as steam. If, after the noncondensable fluids have been thoroughly displaced, the vessel is then allowed to cool while not vented, a very effective vacuum is produced.

If the vessel being steamed is a fractionating tower equipped with overhead condensers, it is possible to create a vacuum even while steaming by using too much cooling water on the condensers. For this reason, it is vitally important that cooling water in condensers be carefully controlled while steaming. It is equally important that sufficient vents be left open while the tower is cooling to guard against the creation of a vacuum.

This material taken from process-training-program manual, Bayway, N. J., refinery of Esso Standard Oil Co.

LIGHT ROTARY RIG for drilling the 120 to 400-ft.-deep source wells. Reverse circulation is used, with salt water as the drilling fluid.

SUBMERSIBLE motor-driven pumps are run in the shallow source wells. Standpipe over well will be pressurized with nitrogen.

Wilmington flood operators tackle sand

TWO MAJOR PROBLEMS connected with injection wells at the huge water flood under way in California's Wilmington field are sand control and corrosion.

The latter is held to a rate that can be lived with through use of inhibitors and noncorrosive materials. Sand control continues to be a problem, especially in the shallower Tar and Ranger zones.

Sand offers little trouble as long as water is being injected. It's when the wells must be shut in for repairs, plugging, or some other reason that the troubles arise. The poorly consolidated sands sometimes backflow, completely plugging the hole and resulting in a time-consuming cleanout job. It also results in collapsed pipe.

Status of flood . . . Because of extensive land subsidence in the Long Beach Harbor area, Wilmington operators are well under way on a program which calls for water injections in excess of 1,000,000 bbl. daily. Through stabilizing pressures in the 3,000 to 4,000-ft.-thick oil zone, it is expected that further subsidence will be eliminated. Increased oil recoveries, estimated at 400,000,000 bbl., will be an added benefit.

Pilot-flood studies were started in June 1953 by the city of Long Beach, largest oil producer in the field. Additional floods were started but by late 1958 the total volume injected daily was less than 150,000 bbl.

Faced with a federal suit which threatened to shut in the entire field, operators this year have made great strides. At mid-December about 390,000 bbl. of brine was being injected through 102 wells. By late January it is expected that 435,000 bbl. daily will be going underground through 120 injection wells. The ultimate rate of about 1,000,000 bbl. daily, involving more than 265 wells, possibly will be reached by late 1960.

The city of Long Beach, because of its large holdings, has financed the construction of the new injection plans and distribution system. It will be repaid by the various units and operators through a surcharge on each barrel of water supplied them. Features of the nine plants which have been completed were described in an earlier article (OGJ, Dec. 21, 1959, p. 66).

To expedite the flood being carried out, cooperative agreements are being set up in five of the field's six fault blocks. Most will be converted to unit operations ultimately, however.

As the flood will be carried out by fault blocks, injection rates have been set for each block. Rates likewise are set for each of the four zones being flooded, the Tar, Ranger, upper Terminal, and lower Terminal. Upstructure injection wells are used in addition to peripherial wells. Each well delivers water to only one zone,

AS AT THIS WORKOVER JOB, some Wilmington producers have been given a plastic-walnut shell treatment in an attempt to overcome a bad sand problem.

plugging and corrosion

so more than 150 new wells will be drilled.

BY D. H. STORMONT
District Editor

Drilling injection wells . . . The city of Long Beach, through its contract operators Long Beach Oil Development Co. and Richfield Oil Corp., has drilled the most new wells. For this reason, most of the following discussion pertains to practices followed on city properties.

Since space is at a premium in the crowded harbor area, and as some wells are bottomed under water, nearly all of the injection wells have been slant drilled. In a few wells where the drift angle was in the order of 45°, bottom of the hole is more than 2,000 ft. from the surface location. This technique creates no particular drilling problem, other than slowing the drilling rate, but it does add to the difficulty of conducting the water flood.

General practice has been to drill a 12¼-in. hole to the top of the zone and cement 9⅝-in. casing. An 8¾-in. hole then is drilled through the interval to be flooded and a blank liner run to total depth. Although some 7 and 5½-in. have been used, most common size liner now run is 6⅝-in.

The liner is cemented from top to bottom, after which the pipe is jet perforated opposite each sand to be flooded. To assure a good cement job, wire scratchers and centralizers are used. The pipe also is reciprocated on a 5 to 10-ft. stroke during cementing.

As from four to seven sands are involved in the 200 to 600 ft. of zone taken in by each injector, perforation and testing for water shutoff can be a time-consuming task. Each sand is selectively perforated to a density of two to four ⅜-in. holes per foot. To assure that the sand is isolated from others in the zone, a water-shutoff test then is made. A minimum of 15 to 20 ft. of blank pipe is left between two sands.

Generally, from 3 to 5 days are required for perforating and testing. In some cases, however, as much as 2 months were required in assuring there was a proper shutoff on each sand.

Obtaining good injectivity . . . Several types of completion fluids and completion techniques have been tried to find which results in the highest injectivity.

In early injection wells, a regular clay-base mud was used for drilling the pay zone. As swabbing was required to attain good injectivity, other types were tried. These included oil base, saturated salt-starch muds, and a low-solids CMC mud. Many of the wells now are being completed with oil-base mud. In a few wells where clay-base muds were used, they were treated with mud acid.

Where clay-base muds were used in earlier wells, a tubing swab was run until a considerable amount of sand entered the well bore. This practice improved injectivity, but because of the time required it is no longer used. Pipe has collapsed in some of the wells but there is no definite evidence that it occurred as the result of swabbing.

Present practice is to place new wells in service without any backwashing. If its injectivity is found to be too low, a novel "shock" treatment has been found helpful.

Beginning with the lowest sand, a bridge plug is seated in the blank liner below and a tubing packer set above. A formation tester run on the tubing string then is opened, essentially opening the sand to atmospheric pressure. The sudden shocks on the sand have proved quite successful in restoring or increasing injectivity. A sand is permitted to backflow for about 2 hours with the tester open.

Injectivity of new wells varies widely, depending upon the zone, number of sands opened, and whether or not it is a peripheral or oil-zone well. A one-sand injection well in the lower Terminal may take only about 1,000 bbl. daily. Some upper Terminal wells, however, have taken as much as 30,000 bbl. daily over a period of months. Some have taken as much as 60,000 bbl. daily on short time tests. Unless it is desired to control the injection rate in some particular sand, all water is injected through the casing.

Some injection wells completed in the early stages of the flood have had pipe failures, both in the sands and

The City of St. Petersburg added to their natural gas distribution system last summer with the installation of a new 12-in. line. Laid in sandy soil along tree-shaded streets, the line went in quickly and tested out perfectly, all due to three factors: sound planning by Stone & Webster Service Corporation, New York, N. Y.; expert pipe-laying practices of Aldridge-Poage, Inc., Lexington, Ky. (now operating under the name, Poage Construction Company, Inc.); and the uniform high quality of Bethlehem electric resistance-weld steel pipe. Industrial Supply Corp., Tampa, Fla., was the pipe jobber.

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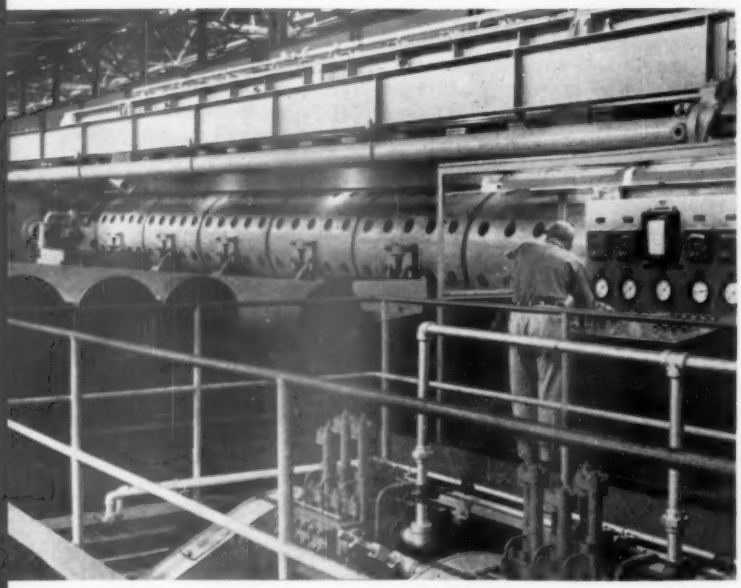

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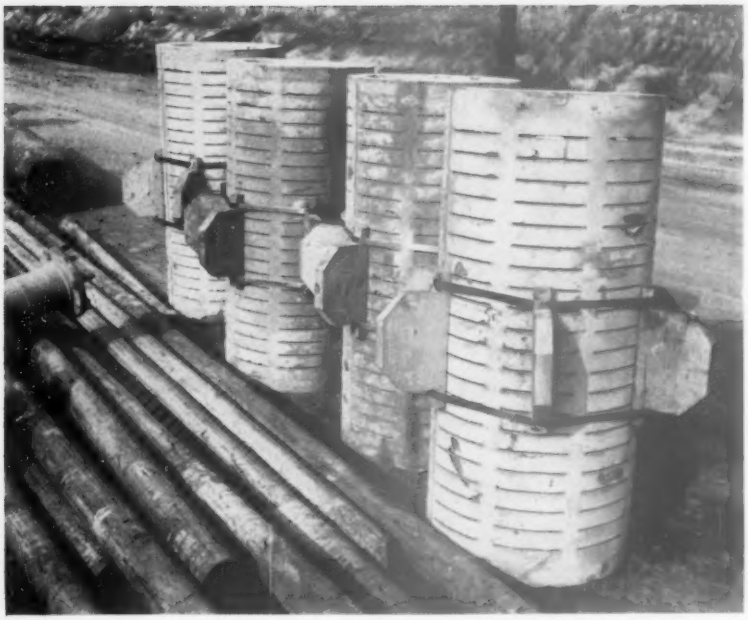

SECTIONS OF 22-in.-o.d. concrete pipe, equipped with centralizers ready for running into a water source well. These perforated lengths will be placed opposite the water sands.

in intervening shale zones. This is now generally thought to have been brought on by pressure readjustments in the reservoir, rather than a heaving sand condition. There have been no failures in the more recent wells. This could be due either to the change in completion technique, or because the zone had already been partially repressured and the readjustments made.

As a general rule, the sand problem decreases with depth. When Tar wells are shut in, due to the need of repairs, the sand will often backflow to such an extent that the tubing cannot be pulled. After this occurred in one well, it was sand-packed with a 6-8-mesh gravel. Where this practice will help solve the problem is unknown at this time, since the work was only recently done.

Source wells . . . All water is obtained from shallow source wells, drilled near the injection plant they will supply. Bottomed in sands at depths of 120 to 400 ft., the wells yield water comparable to sea water except that it is oxygen-free and less turbid. The average well is restricted to an output of about 30,000 bbl. daily.

All recently completed source wells were drilled with a light reverse-circulation rig. In place of drilling mud, salt water from other source wells was used. This elminated the need for the wells being swabbed to remove the mud cake, and allowed larger perforations to be used.

In earlier wells, plastic-coated steel liners were run. Because of their poor performance, a minimum of steel is now used.

The practice followed in newer wells is to drive a 42-in. steel conductor pipe to about 30 ft., and drill a 40-in. hole to total depth. Concrete pipe of 22 in. o.d. and a wall thickness of 2½ in. then is run on wire lines. The liner is made up so that the portion opposite the water sand contains 125 mesh slots (see photo). To assure that the pipe will be centered in the hole, wooden centralizers are strapped around each of the lower sections.

After all pipe has been run, the hole is gravel-packed. Gravel size varies from 12 to 16-mesh to ⅜-in. gravel. Proportions used are designed to give a pack which will exclude almost all sand from the well bore.

The submersible motor-driven pumps run in the source wells are noncorrosive throughout. The 75-hp. motors are sealed in stainless-steel cases. The vertical turbine assemblies above the motors also are constructed from stainless steel. Flanged lengths of plastic-coated pipe are used as casing, joined together with stainless-steel bolts and nuts. As a final protective measure, at some wells a 42-in.-diameter standpipe is placed over each well and the interior pressurized with nitrogen to exclude air.

Corrosion considerations . . . Ocean water is used because it is readily available in large quantities and requires no filtration. But a major corrosion problem is created. Corrosiveness of the brine is thought to be due largely to sulfate-reducing bacteria, since the water is essentially oxygen free. Experience gained in early trial floods indicates an average corrosion rate of 13 m.p.y. could be expected if inhibitors are not used.

The problem is largely solved in source wells through use of noncorrosive materials. In flow lines to some plants, transite pipe is the solution. At other plants, interior-plastic-coated steel pipe is used.

Noncorrosive materials likewise are the solution in the high-pressure injection pumps. Where horizontal and vertical quintuplex pumps are used, they are equipped with solid ceramic plungers. The fluid ends are aluminum bronze with stainless-steel valves and seats.

Downstream from the injection plants, where high pressures require use of steel pipe, inhibitors are depended upon to hold corrosion to a rate that can be lived with.

Initially a variety of chemicals were tested to determine their effectiveness in reducing corrosion. Organic compounds proved to be the most effective. This field then was narrowed to compounds of the amine type, which prevent bacterial growth as well as acting as corrosion inhibitor. Injected at concentrations of about 20 p.p.m., the inhibitor reduces the rate to less than 1 m.p.y.

Tanks of 200 to 250-bbl. capacity are installed at each plant for storing the inhibitor. At plants where tanks are used for settling out sand, the chemical is injected prior to the water entering the tank. Where the plants are of the flowline type, the inhibitor is introduced in the pump suction line.

Approximate treating cost is averaging about 1.5 mills per barrel of injected water, using a concentration of 20 p.p.m. Ability to handle chemicals in tank-truck lots is partially responsible for the low treating cost.

Under present operations, only ocean water is being injected. No produced water is mixed with ocean brine and reinjected. So far there have been no indications the two waters are not compatible under reservoir conditions. But if they are mixed aboveground, the high sulfate content of the sea water (about 2,500 mg. per liter) unites with barium to form a barium sulfate precipitate.

As the flood progresses the amount of waste water which must be handled daily will rapidly climb from the 100,000-bbl. current level. Wilmington operators thus eventually will be faced with the alternative of greatly increasing their water-cleanup facilities or of reinjecting it in place of ocean water.

BY W. L. NELSON
Technical Editor and
Petroleum Consultant

Characterization factors and crude-oil properties

In the tabulation of crude-oil properties in your Fourth Edition of Petroleum Refinery Engineering, what is the meaning of characterization factor at 250°, 450°, 550°, and 750° F.? Is it at 250° F., etc., or is it for the whole crude oil? D.C.D.

The characterization factor at 250° F. means this factor for the material that boils at 250° F. Consideration also reveals that characterization factor does not change much through several degrees of vapor temperatures during a distillation and therefore the factor obtained at 250° F. is reasonably correct in many instances for materials that boil at temperatures of even 200° to 300° F.

For the same reason, poorly fractionated materials, that is, less well-fractionated than those obtained by a so-called true-boiling-point distillation have the same characterization factors as well-fractionated mixtures except that the temperatures recorded in gross distillations such as ASTM or Saybolt (10%) distillations are not correct. Thus characterization factors cannot be computed from the 250° F. (and 450° F., etc.) temperature recorded in Saybolt or ASTM type distillations (except at or near the 50% boiling point which happens to be almost coincidental in all types of distillations).

Only true-boiling-point or Hempel vapor temperatures can be used to compute characterization factor but the author has always felt more confident when Hempel vapor temperatures are converted to approximate true-boiling-point temperatures by methods such as the one proposed on page 114 of the Fourth Edition of Petroleum Refinery Engineering (McGraw-Hill Book Co., Inc., N. Y., 1958).

The basic concept of the characterization factors at 250° F. (450° F., etc.) tabulated in Petroleum Refinery Engineering for crude oils is the instantaneous or differential characterization factor of the droplet of material that boils at 250° F., etc., using the specific gravity at 60° F. of the droplet. If wider boiling ranges than about 200° F. are considered, it is necessary to obtain or estimate the molal average boiling point (Pet. Ref. Engineering, Fourth Edition, p. 172). Another difficulty arises, however, namely that a range of characterization factor may be involved. An average or range of characterization factor may mask the usefulness of the factor and may even be misleading. Thus the application of characterization factor to entire crude oils is not of much value, as one example, the average characterization factor of certain Venezuelan crude oils indicates paraffinic-type oils whereas such oils are actually somewhat naphthenic intermediate base oils which contain very large amounts of high-characterization-factor paraffin wax.

Characterization factor is discussed (especially its application) in Petroleum Refinery Engineering, pages 81-181, and some of the more recent articles that have appeared on this page in The Oil and Gas Journal are:

January 14, 1952, p. 123: Characterization Factor and Chemical Composition.
July 27, 1953, p. 369: High-Boiling-Hydrocarbon Analysis.
November 16, 1953, p. 346: Characterization Factor and Viscosity Index.
December 14, 1953, p. 157: Properties of Cycle Stocks.
February 22, 1954, p. 197: Freezing Points of Jet Fuels.
March 29, 1954, p. 131: Effect of Dewaxing on Viscosity Index.
May 3, 1954, p. 119: Characterization Factor of Refining Stocks.
May 24, 1954, p. 271: Kauri Butanol Number of Solvents.
June 28, 1954, p. 132: Pour Point of Diesel Fuels.
June 20, 1955, p. 117: Refinery Stocks for Carbon Black.
June 20, 1955, p. 118: Low Cold Test Crudes Are Rare.
October 22, 1956, p. 135: Base of Oil and Diesel Index.
March 28, 1957, p. 156: Viscosity Gravity Constant versus Characterization Factor.
May 6, 1957, p. 145: Characterization Factor of Catalytic Gasoline.
August 26, 1957, p. 129: Platinum Reforming Yields.
November 18, 1957, p. 246: Octane Number of Reformer Feeds.
December 2, 1957, p. 118: Characterization Factor of Crude Oil Products.
December 16, 1957, p. 131: Wax Content of Lube Stocks.
August 25, 1958, p. 103: Carbon-Hydrogen Ratio of Distillate Fuels.

Conductivity of stainless steels

Can you give me references or information on the thermal conductivity of stainless steels at subzero temperatures? W. G.

Information is not readily available on the conductivity of stainless steels at low temperatures. However, the American Metals Society or the magazine Materials and Methods (Cleveland) should be able to furnish information.

In general, the conductivity of stainless steels is lower at room temperature than at high temperatures (the opposite of plain carbon steels) as shown in my Refiners Notebook No. 124, December 21, 1946, p. 87. Although one should expect that extrapolation to lower temperature would be possible with at least the stainless irons (under 0.08% carbon), it is not certain that sharp changes in structure (and conductivity) would not occur at lower temperatures with the customary 0.2% carbon stainless steels or with alloys of higher carbon content.

The data of Refiners Notebook No. 124 were taken from the bulletins of steel companies, so you might enlist the aid of the research departments of the steel companies or International Nickel Co.

Finally, the series of three articles by R. J. Corruccini entitled "Properties of Materials at Low Temperatures," Chem. Eng. Progress, June-August, 1957, indicates, as one might expect, that the thermal conductivity of most materials decreases rapidly as absolute zero is approached. Fig. 3 of the second of the articles indicates a conductivity of about 0.005 watts per centimeter per °K. for stainless steel at 4° K.

Lube-oil tests can be used to reveal wear in pipeline compressor engines

BY D. V. KNIEBES
Institute of Gas Technology

THE FEASIBILITY of using lubricating-oil analyses to detect increased rate of wear of engine components before failure has been demonstrated in a 2-year study of 84 pipeline compressor engines. Emission spectrographic analyses were used to determine metal content of lube-oil samples.

Normal contaminant levels . . . The large number of variables present in this first-year study would indicate that general correlations would be very difficult; however, 30 of the 54 engines which used nondetergent oil during the test period can be included in a single category. Contaminant

From a report to the American Gas Association.

TABLE 1—COMPARISON OF TOTAL ACID NUMBER AND AVERAGE IRON CONTENT OF NONDETERGENT OILS FROM 30 NORMALLY OPERATING ENGINES

Total acid number	Avg. iron content, p.p.m.	No. of measurements
0.0	2	17
0.1	3	21
0.2	4	33
0.3	5	19
0.4	4	30
0.5	5	20
0.6	5	28
0.7	5	29
0.8	5	17
0.9	4	17
1.0	3	8
1.1	3	5
1.2	5	10
1.3	5	4
1.4	4	7
	Total	265

concentrations in oils from these engines did not exceed the following limits throughout the test period:

Silicon	4 p.p.m.	Copper	2 p.p.m.
Iron	10 p.p.m.	Lead	2 p.p.m.
Chromium	1 p.p.m.	Tin	2 p.p.m.
	Aluminum 2 p.p.m.		

None of the engines in this category had any unusual maintenance due to excessive wear. Since this group of engines is representative of the majority as to manufacturer, model, and oil used, it may be possible to set up recommended specifications for maximum allowable contaminant concentration in the nondetergent lube oils of engines in gas-compressor service. There will, of course, be some exceptions due to differences in oil-filtration techniques and frequency of oil changes, but even these tolerances appear to be very broad.

Similar maximum concentration limits are used for diesel locomotive engines by the railroads, except that iron concentration is considered normal up to 35 p.p.m.

Seasonal variations . . . It is interesting to note that the iron content of the oils from normally operating engines tends to rise during the winter months, and then fall during the spring and summer. This is apparently due to the higher engine loading which occurs during the winter, and indicates an increase in ring and cylinder wear during the high load periods.

The average monthly iron content of the oils from the 30 normal engines ranges from a low of 2 p.p.m. in August to a high of 7 p.p.m. in January. The ratio of the average iron contents of the three highest winter months to the three lowest summer months of these oils ranges from 1.4:1 to 4.5:1, and averages 3:1. Although many factors can affect this ratio for an individual engine, it may be possible in the future to use this normal winter-summer wear-rate ratio to assign limits on the change in iron content of an oil before excessive wear is suspected.

Pentane-insoluble content . . . The pentane-insoluble content of a lubricating oil consists of gums, oxidation products, and dirt. Although this is an important characteristic of a used lubricating oil, the pentane-insoluble content of the samples received from all engines during the test program was so consistently low that no information was gained from the data. As a result, this test was not continued during the second-year program.

Neutralization number . . . The neutralization or total acid number is a measure of the acidity of the oil. It was felt that particularly the iron content of the used oils might be sensitive to this acid number because of increasing tendency toward crankcase corrosion with increasing acid number.

Table 1 shows the average iron content versus total acid number for

TABLE 2—GROUPS OF ENGINES AND OILS

Group	Number of engines	Types of detergent oil used	Remarks
1	6	3	New oils contained trace elements normally determined. Oils from engines contained high levels of contaminants which prevented interpretation.
2	2	1	New oil contained no trace elements normally determined. Oil with 6,000-hour life behaved like Group 1 oils. Oil with 36,000-hour life behaved like Group 3 oils.
3	7	5	New oil contained no trace elements normally determined. Oils in use appeared similar to nondetergent oil.

TABLE 3—ANALYSIS OF OIL IN TWO ENGINES

Date	Engine A May, 1956	Engine B May, 1956
Engine hours on oil	37,000	6,000
Neutralization No.	0.4	1.5
	element concentration, p.p.m.	
Silicon	2	4
Iron	14	61
Chromium	<1	<1
Aluminum	2	2
Copper	5	50
Lead	1	35
Tin	1	8

TABLE 4—SPECTROGRAPHIC ANALYSES SHOWING RING AND BEARING WEAR

Sample date	Oct. 25-55	Nov. 25-55	Dec. 26-55	Jan. 25-56	Feb.* 24-56	Mar. 26-56	Apr. 25-56	May 25-56	June 25-56	July 26-56
Neut. No.	0.1	0.3	0.2	0.3	0.3	0.9	1.1	0.6	0.5	0.5
	Element concentration, p.p.m.									
Silicon	1	1	1	7	7	4	3	2	6	2
Iron	2	6	15	59	64	36	20	8	8	2
Chromium	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Aluminum	<1	<1	1	1	1	1	1	1	3	1
Copper	1	1	1	3	3	3	2	2	1	1
Lead	1	1	1	2	2	2	3	1	2	<1
Tin	1	1	1	3	4	3	4	2	4	2

*Rings and main bearing-half replaced.

TABLE 5—SPECTROGRAPHIC ANALYSES SHOWING BEARING WEAR

Sample date	Dec. 5-55	Jan. 5-56	Feb. 6-56	Mar. 6-56	Apr. 5-56	June 5-56	July 5-56	Aug. 5-56	Sept. 5-56
Neut. No.	0.2	0.3	0.5	0.5	0.1	0.7	0.4	0.5	0.5
	Element concentration, p.p.m.								
Silicon	4	2	3	2	2	2	2	1	1
Iron	19	17	16	23	16	10	10	5	5
Chromium	<1	<1	<1	<1	<1	<1	<1	<1	<1
Aluminum	1	1	1	1	1	2	2	1	1
Copper	8	4	<1	6	8	7	7	6	4
Lead	3	4	3	3	2	1	2	2	8
Tin	3	2	3	21	10	27	26	11	7

oil samples from the 30 engines which operated normally on nondetergent oils during the test program. With the possible exception of oils with acid numbers of less than 0.3, there is no apparent effect of acid number in this range on the iron content of the oil. The acid numbers of 0.0 to 0.2 are usually due to new oil in the engines, and it would not be expected that the iron content of the oil would have reached an equilibrium value.

Detergent oils will normally have acid numbers of 1.0 or greater due to their additives. Since the additives tend to keep impurities in suspension, the iron content of the oil in use should be high, but not as a result of the acid number. It is, therefore, not possible to include detergent oils in these data, since a misleading correlation will result. Similarly, engines experiencing abnormal wear cannot be included, since the iron content is obviously due to causes other than acidic corrosion.

It can be concluded that total acid numbers in the range of 0.0 to 1.5 will not have a significant effect on the iron content of the lubricating oil by corrosive action. Corrosion effects from this source can, therefore, be disregarded as a source of variation in the metal content of the used oils.

Detergent oils . . . Fifteen engines in the first year's program used detergent oils. Nine types of oil from seven refiners were represented. The engines and oils can be conveniently divided into three groups (Table 2).

Only the Group 1 oils contained additives partially composed of one or more elements normally determined as wear metals in crankcase oils. The detergent properties of these oils also retained high levels of engine-wear metals suspended in the oil. Their use as indicators of abnormal wear rates was, therefore, prevented, since low-order wear trends were masked by the high and erratic normal contaminant levels.

The detergent oil used in the engines of Group 2 produced, when new, the same high contaminant levels as the Group 1 oils, although none of the trace elements determined is found in the new oil. After long use in the engine, however, the detergent properties of this oil disappear. Typical analyses of this oil in two engines of the same make are shown in Table 3.

The oil in Engine B had been in use for 6,000 hours and had good detergent properties, as evidenced by the analysis. The same type of oil in Engine A, however, had 37,000 hours of life. In this case the analysis is typical of that of a nondetergent oil.

Another possible use of lubricating-oil analysis is apparent from these data; it might well be used as an indication of the need for supplemental additives, replacing a fixed time schedule for the addition of concentrated detergents to replace losses, as is commonly practiced.

The Group 3 oils did not show the same high detergency properties, since the crankcase oil of the engines in which they were used contained essentially the same contaminant levels as nondetergent oils. Two instances occurred in this group of engines in which abnormal wear was predicted by the analytical data and was con-

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firmed by engine inspection. Evidently the use of these types of detergent oils is not detrimental to the value of this method of wear-rate measurement.

Partially explained data . . . The crankcase oils from nine engines contained higher than normal contaminant levels with no apparent explanation. Three of this group had somewhat high iron contents for 2 or 3 months, followed by a return to a normal level. Excessive ring wear which may have occurred during these few months apparently was not sufficient to warrant replacement.

The remaining six engines had oils which contained higher than normal concentrations of bearing metals. No bearing deterioration was reported, however. The oils from two of these engines also had high iron levels, but probably the high contaminant levels can be explained by the fact that both oils had been in use for over 25,000 hours without an oil-filter change. Also, no makeup oil was added during the year. One of the engines had a ring change, and the connecting rod bearing clearances were reset. The resulting wear-in produced high lead and iron levels for several months.

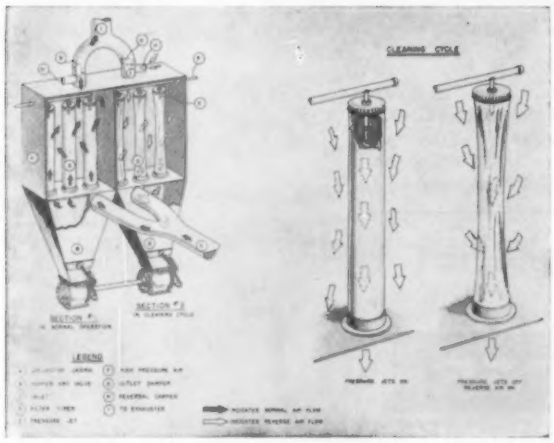
Occurrences of excessive wear . . . Analyses of monthly samples of lubricating oil from an engine which required replacement of several rings and a main bearing-half in February 1956 are given in Table 4. The rise in iron content of the oil in November was not considered abnormal because of the higher engine load which occurs during the winter months. The December and January samples showed a much higher rise in iron content than would be expected. In addition, the January sample showed an increase in silicon, indicating the presence of dirt, and increases in lead, tin and copper, indicating increased bearing wear.

The sample taken in February, when repair was necessary, showed the highest iron and tin content of the series. After repairs had been made, the impurity concentration dropped to normal during the next few months. This reduction in impurity content would have taken place much more rapidly if the oil had been well filtered or changed after repairs had been made.

An example of the detection of impending bearing failure is shown in Table 5.

▶ ▶ ▶ New Equipment Section

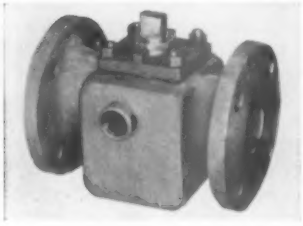
This week's SHOWCASE features . . .



Solution to air-pollution

. . . caused by high-temperature fume and dust emissions is offered by a new dust collector. The Type CO cloth-tube collector is designed for use with glass filter fabric that permits filtration at temperatures up to 550° F. where natural and synthetic fabrics are unsuitable.

Dust is collected on the inside surfaces of the filter tubes which are cleaned by a pressure-jet method. A jet inside each filter tube provides short blasts of high-pressure air, alternating with a small amount of reverse air flow from the main fan. The unit is automatic and controlled by an adjustable timer. Source: **Pangborn Corp., Hagerstown, Md.**



Viscous fluid flow

. . . controlled with a sleeved valve now available in a jacketed construction. Designed for applications involving heated or cooled media, particularly where valve performance may be a problem, the Tufline sleeved valve has a Teflon sleeve to keep the valve tight without readjustment, at the same time allowing for expansion and contraction of the Teflon over a wide range of temperature and pressure. The Teflon sleeve also eliminates the need for lubrication, thus keeping the stream free from contamination.

The valve comes in standard 150-lb. and 300-lb. two-way and three-way bottom-entry designs. The valve is wrench-operated in flanged-end sizes from ½ through 3 in. and gear-operated in sizes of 3 through 6 in. Delivery time ranges up to 8 weeks. Approximate price ranges from $85 for a ½-in. carbon-steel valve to $790 for a 6-in. alloy valve. Source: **Continental Mfg. Co., 247 Park Avenue, New York 17.**

Microwave system

. . . keeps operating when commercial power fails through the use of a new transistorized inverter power unit recently developed for microwave communication emergencies. The Instapac unit bridges the few seconds gap of power loss which occurs between the time commercial power is interrupted and the engine-driven standby electric plant starts, comes up to required speed and voltage, and takes over the load.

Main components of the unit include the inverter, load-transfer relay, start-stop relay, test switch, and indicator light. Batteries, while required, are not part of the inverter. For normal installation, automotive-type 12-volt batteries connected in series to provide desired voltage can be used.

The inverter power unit comes in either a 10-in. relay-rack mounting with the necessary controls or in a wall-mount cabinet in input voltages of 24, 36, and 48 volts in a 1 kva. size. It can be used in combination for greater capacity. Delivery time: about 30 to 45 days. Price: about $1,000. Source: **D. W. Onan & Sons, Inc., Minneapolis 14.**

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Load handling made simpler

. . . with a new hydraulic crane now available for trucks. It is expected to save time and manpower in handling pipe and other equipment. The Model 400-E Versa-Lift crane is hydraulic-powered and has an extensible and retractable boom. A cable takeup system keeps loads at the same height, or distance from the sheave for vertical movement, as the boom is extended or retracted.

One feature of the extensible boom is that it extends or retracts under full load regardless of the angle of the boom. Yet the load capacity of the boom or crane is not affected.

The crane works in a complete circle and lifts from 7,000 lb. at 8 ft. to 3,500 lb. at the fully extended position of 16 ft. Delivery time: 7 to 10 days. Price: about $4,000. Source: **Teale & Co., Box 308, Omaha.**

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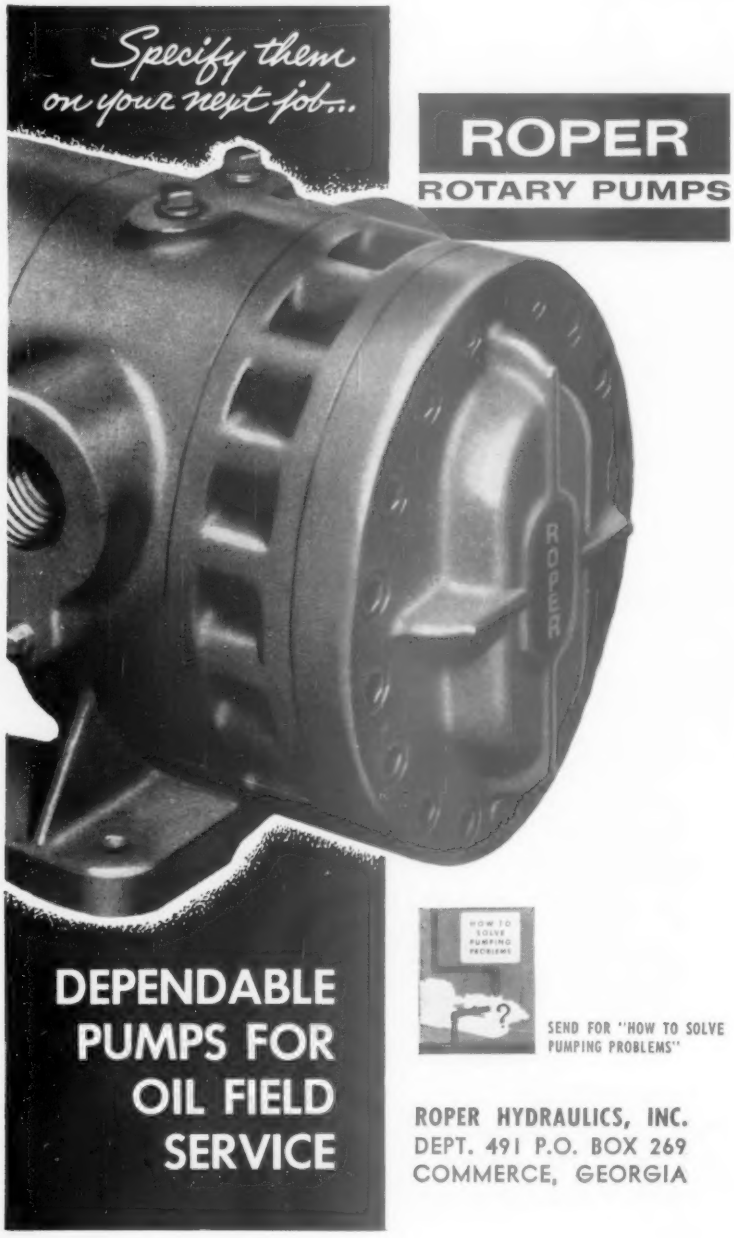


Fire detected

. . . automatically with the Falcon automatic fire detector now on the market. The device is easily installed and self-contained. Powered by freon, the device has a sight glass to show the level of the liquefied gas, to which coloring has been added, so it can be quickly checked at a glance to be sure the unit is always fully charged and ready to operate. This eliminates the requirement of Underwriter's Laboratories that older models had to be weighed at 6-month intervals.

The S series detector comes with temperature rating of either 136° or 174° F. When the heat of a fire reaches the temperature at which the device is rated, it automatically gives a loud warning. Available from stock, the device sells for about $36.50. Source: **Falcon Alarm Co., Inc., 243 Broad Street, Summit, N. J.**

●

Field crew

. . . scheduling is easier with a new two-band medium and long-wave portable radio now available. The Royal 780 radio can be used to obtain de-

tailed weather information where government-operated weather navigation stations broadcast on the long-wave band.

The radio provides long-distance reception of medium-wave stations on the 188 to 555-m. band plus long-wave stations on the 750 to 2,000-m. band. It has a tuned RF stage with three-gang condenser to give high selectivity and sensitivity, and minimize medium-wave station interference on the long-wave band.

Powered by six Type C torch batteries, the radio weighs, with batteries, 5 lb. 1 oz. It measures 9 in. long, 5½ in. high, and 4⅞ in. deep. It sells for about $100. Source: **Zenith Radio Corp., 6001 West Dickens Avenue, Chicago 39.**

•

New meter

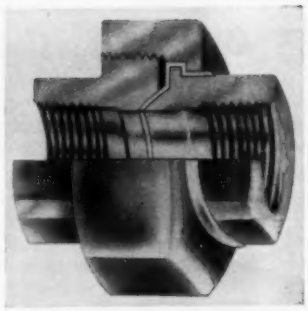
. . . for low flows now available takes rough use in purge service, liquid-level control, and other applications. The glass-tube type of purge meter comes with either a 3-in. scale for easy reading or with a 1½-in. scale for saving space. It reads directly in gallons per hour of water or standard cubic feet per hour of air. Except for the metering tube and frame, all parts are interchangeable, regardless of scale length.

Metering tubes and floats cover a flow range of 0.01 to 30 gal. per hour of water or 0.12 to 125 s.c.f. per hour of air. An external, stainless-steel spring holds the meter-tube assembly in place. Optional is a differential regulator to control pressure drop across the needle valve and not across the meter. Delivery time: 30 days. Approximate price: $13 to $18. Source: **Wallace & Tiernan, Inc., 25 Main Street, Belleville 9, N. J.**

Union

. . . aids corrosion prevention for water and gas-service lines, oil-well casing, and other piping as it is an insulated type that requires no assembly of loose gaskets or insulating material.

The union comes in sizes of ¼ through 2 in. in ratings of 150-lb. malleable iron and 3,000-lb. forged steel. They are available from stock. Prices of the 150-lb. union range from about $0.84 for the ⅜-in. size to $2.82 for a 2-in. size. Prices of the 3,000-lb. union range from about $2.51 for a ¼-in. size to $7.97 for a 2-in. size. Source: **Central Plastics Distributing Co., Box 762, Shawnee, Okla.**



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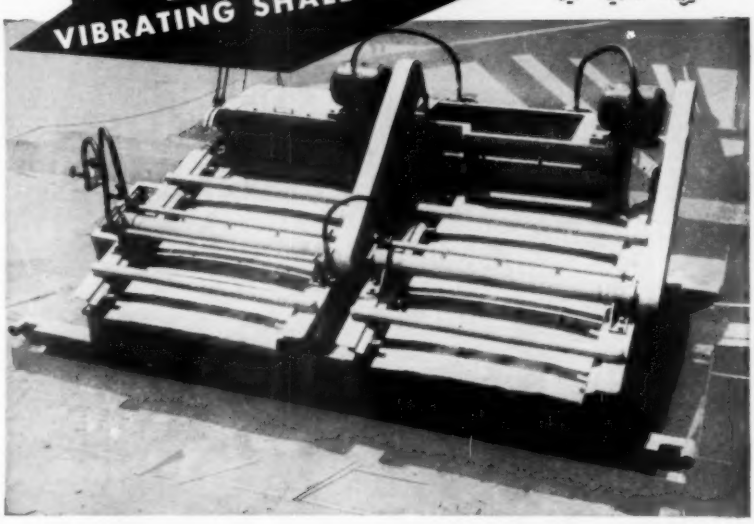

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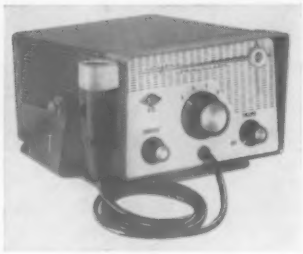


. . . for citizens'-band service just announced operates within the 26.965 to 27.235 mc. citizens' band recently assigned by FCC for virtually unrestricted business or personal use. The G-12 model radio is a complete two-way station. Four crystal-controlled channels for both the transmitter and receiver offer considerable operational versatility. The operator can switch to other channels if voice traffic is heavy or if interference is present on the channel in use.

The radio also permits various stations in a system, such as cars, trucks, aircraft, or boats, to be assigned different channel frequencies. The transmitter is rated at 5 watts power input. The transmitter, receiver, and power supply are all in one compact cabinet that weighs 11 lb. Approximate price of the Model G-12 complete with press-to-talk microphone and crystals for one channel is $150. Source: **Gonset Div., Young Spring & Wire Corp., 801 South Main Street, Burbank, Calif.**

●

Equipment

. . . clamped together fast with a new clamping method called Band-It. The clamping method promises to cut costs and save time in clamping rotating wall scratchers, multiple strings of tubing, instrument cables to tubing, and many other petroleum industry applications. Any diameter or irregular shape can be clamped quickly and economically with the method, the maker says.

To form a clamp, one end of a stainless-steel band is threaded into a stainless-steel buckle, and the band is wound twice around the two pieces of equipment being clamped together. Up to 2,400 lb. tension can be applied. After desired tension is applied to the band, the band is cut off with the tool and the buckle ears hammered over the band end to form a durable clamp. Diameters over 30 ft. may be clamped by splicing the band. Source: **Band-It Co., 4797 Dahlia Street, Denver.**

●

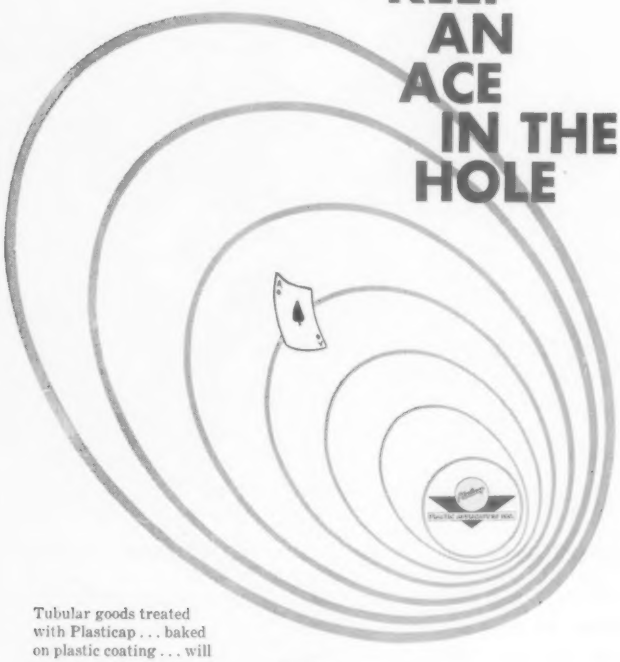
More safety

. . . for air lines is offered by a safety valve now on the market that is engineered to shut off the flow of air, gases, or liquids the instant a break occurs beyond the valve.

The Sands safety valve consists of a brass housing, valve disk, and two springs on either side of the valve disk. In normal operation, the flow of air is not impeded by the valve disk as the

Throw away the joker . . .

KEEP AN ACE IN THE HOLE



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free area around the disk is equal to the inside diameter of the supply pipe and the pressures on both sides of the disk are approximately equal. But when a break occurs in the hose beyond the valve, the upstream and downstream pressures become unequal. This causes the valve disk to close and stop fluid flow. Sizes range from ⅜ to 1 in. Capacities range from 15-30 to 85-190 s.c.f.m. Prices range from about $16 to $43. Source: **Sands Safety Valve Co., 3606 Federal Street, Camden 5, N. J.**

•

Storing, shipping

. . . made easier with these folding and stacking type of boxes now available. The corrugated boxes not only provide considerable convenience in handling materials but also make possible a way to save space in the plant or warehouse.

The flexibility of the boxes is achieved by the use of a keyhole locking device and hinges. These permit all four box sides to be folded for storage when they are not used.

Safety pockets on the corner posts give rigid support for stacking the boxes to the desired height. The maker's standard boxes are available from stock. Price for the boxes is about 10% more than that for solid or nonfolding containers of similar size. Source: **Palmer-Shile Co., 16057 Fullerton, Detroit 27.**

•

Nuclear products

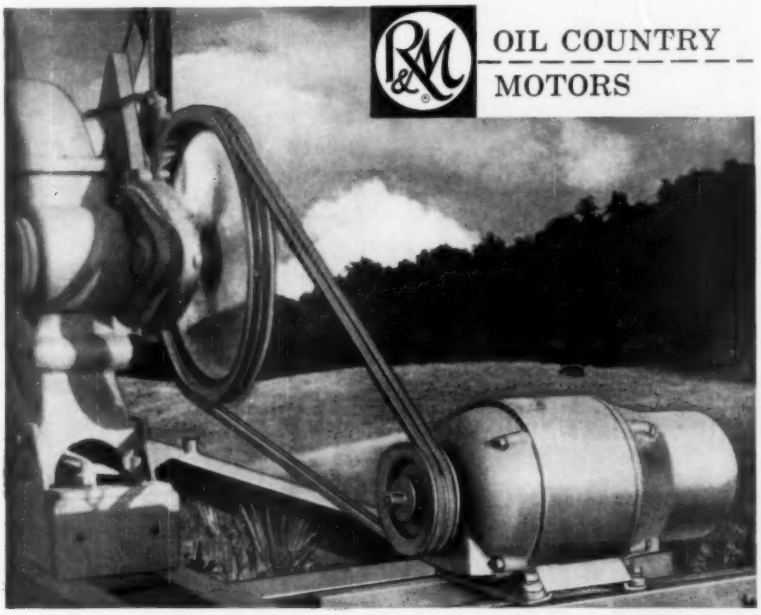
. . . have just been announced for handling and using strong radioactive sources. The products include an industrial gamma radiography machine for radiographic inspection of heavy castings and welds. They can be obtained as small hand-carried cameras for field radiography or as large units containing large amounts of isotopes that are safe and automatic in operation.

Also available are gamma irradiators for studying chemical and physical effects of gamma rediation on materials and products, along with special radiation-monitoring devices for use with the preceding equipment. Source: **Radiation Engineered Services, Lafayette and Water Streets, Norristown, Pa.**

Supervisors

. . . can move away from their radio-equipped vehicles yet hear radio messages with a new 15-watt speaker now available for Motrac two-way radios. The power voice speaker triples normal speaker audio output, enabling users to hear radio messages even when several hundred feet from the vehicle.

The speaker is also equipped with an 8-ft. coil cord and mounting brackets that provide temporary mounting of the speaker outside the vehicle window. The speaker sells for about $40. Source: **Motorola, Inc., 4501 West Augusta Boulevard, Chicago 51.**



REMOTE LOCATIONS *need*
Maintenance-Free R&M Motors!

New Robbins & Myers
Single Phase *"All Weather 40" Oil Country Motors*

Ratings up to 20 HP, eliminate maintenance and constant attention when they replace internal combustion engines in remote areas. Motors are fully weatherized against moisture, dirt, heat. Auxiliary mechanism is externally mounted for simple inspection, even while motor is running. For reduced current starting, sizes above 7½ HP (10, 15, 20 HP) have unique *"cushion start"* system available as extra-cost option. Write for Bulletin 470-OG

ROBBINS & MYERS, INC.
MOTOR DIVISION • SPRINGFIELD, OHIO

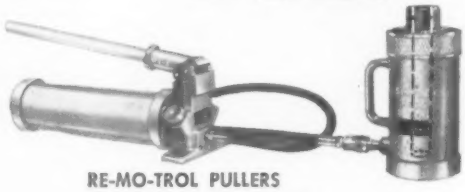
81 hydraulic models to choose from!
THE WORLD'S MOST COMPLETE LINE

SIMPLEX
HYDRAULIC JACKS and PULLERS

STANDARD HYDRAULIC JACKS
11 Models
1½ to 100 tons capacity
5¼" to 22" travel

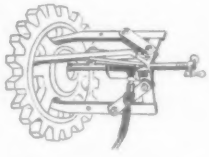
"JENNY" CENTER-HOLE HYDRAULIC PULLERS
6 Models
30 to 100 tons capacity
3¼" to 10" travel

ROL-TOE FOOT-LIFT HYDRAULIC JACKS
3 Models
10 to 50 tons capacity



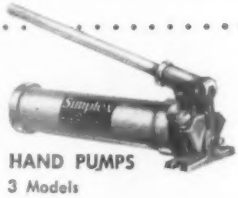
RE-MO-TROL PULLERS
Solid and Center-Hole Rams
39 Models
10 to 300 tons capacity

HYDRAULIC SERVICE and BUMPER JACKS
9 Models
1¼ to 20 tons capacity
13½" to 19" travel



HYDRAULIC PULLERS
4 Models
20 and 30 tons capacity
Push-Pullers, Double and Triple-Grip Pullers

POWERED PUMPS ELECTRIC, GAS OR AIR – 6 Models



HAND PUMPS
3 Models

Look for further information on Lever and Screw Jacks in other advertisements.

TEMPLETON, KENLY & CO.
2539 Gardner Road
Broadview, Illinois

A. C. Templeton, 5627 Del Roy Drive, Dallas, Texas

CONTINUOUS SPIRAL SCRAPER

LONGER SPIRAL circles rod each 15"

PLASTIC COATED

REVERSE SPIRAL at center

NO WELDING ON RODS

TAPERED WING-ENDS protected by shoulder of rod

NOW FIELD INSTALLED AT NO EXTRA COST!

Slash downtime and transportation costs. We install orders of 40 or more at shop prices! . . . just **25¢ per rod ft. installed.**

1. MOVES MORE PARAFFIN! Longer spiral means stronger flow, less foothold for clinging paraffin.

2. SAVES TIME! Run it fast; tapered, protected ends can't hang.

3. PROTECTS RODS! Full-length design stops damaging vibration. Reverse spiral prevents unscrewing. No welding on rods.

FOR EXPORT—We furnish detailed directions for installation by any competent welder.

For literature or details, contact us or one of these dealers:

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SHREVEPORT, LA......Noel E. Coburn
HOBBS, N. M......Badger Bit & Specialty

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Magnificent bayfront accommodations—one-of-a-kind rooms and suites, designed for connoisseurs, comfort seekers, cosmopolites from the world over!

"Summit" meetings of top people . . . every day at the world-famed Top O' the Columbus, 17 floors up! Gourmet fare, rare wines from the Columbus wine cellar; spectacular views of ocean, city, and bay!

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For reservations, call Miami, FRanklin 3-2671
AMERICAN EXPRESS CHARGE CARDS ACCEPTED

SHOWCASE . . .

New Literature

Cleaning-solvents

. . . bulletin will enable you to select a formulation meeting specific cleaning requirements. The free, two-page literature piece should help you eliminate the use of high-cost solvents for routine cleaning. The series of 11 formulations ranges from low-cost washup solvents to high-safety-factor blends for hazardous locations. The literature lists applications, safety factors, flash points, relative drying time, and prices. Source: **Harco Chemical Co., Cranford, N. J.**

Hand and power

. . . winches including both spur and worm-gear models with capacities up to 5,000 lb. are detailed in a new six-page folder. It gives photos, construction features, specification tables, ratings, and general information. Source: **Thern Machine Co., Winona, Minn.**

New valves

. . . for filtration plants including filter drain valves, backwash valves, and rewash valves are described in an eight-page publication just released. Bulletin W-18 offers line and cutaway drawings, drain and backwash-valve features, wall-thimble dimensions in inches, specifications, and technical information. Source: **Golden-Anderson Valve Specialty Co., 1266 Ridge Avenue, Pittsburgh 33.**

Cooling-water

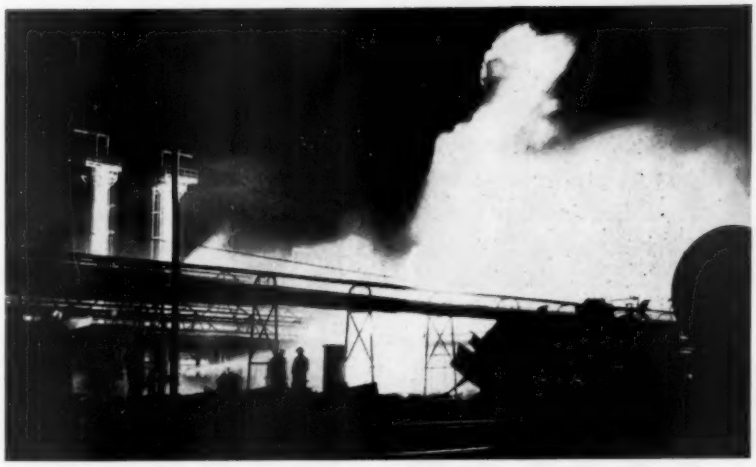
. . . treatment methods is discussed in a new two-page data sheet now available. This informative technical discussion covers the Dianodic method of corrosion control and how it has revolutionized the treatment of open recirculating cooling-water systems. The data sheet contains a chart showing corrosion results obtained with this method. Source: **Betz Laboratories, Inc., Gillingham and Worth Streets, Philadelphia 24.**

Precision test gage

. . . Bulletin M-28A gives: (1) accuracy and sensitivity specifications; (2) dial-graduation reproductions of available capacities; (3) finish specifications; (4) models obtainable; (5) mounting dimensions; and (6) drawings.

The bulletin shows a full-size re-

Reduce Explosion Danger In Processing Operations



JZ **INERT GAS GENERATORS**

The only units designed and manufactured by **burner specialists** to eliminate the hazards common to inert gas generating.

MAXIMUM BURNER STABILITY FOR MAXIMUM SAFETY

- **Wide Turn-Down Ratio**
- **Minimum Corrosion . . .**

Combustion chamber is designed to minimize the formation of partially oxygenated and corrosive compounds

SIMPLE . . . RUGGED . . . COMPACT

The John Zink inert gas generator is so compact it requires less floor space than any other comparable unit.

Flanged components are used throughout for easy servicing. Each part may be removed without interfering with any other part.

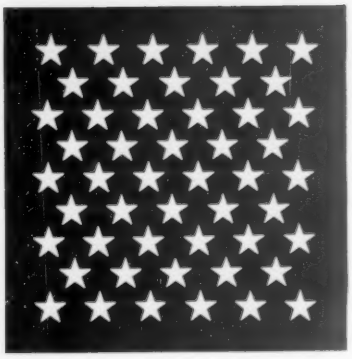
The easy, economical way to provide maximum safety and efficiency for your plant and personnel in purging, storing, conveying and controlling in a variety of process operations.

WRITE FOR BULLETIN G-59

John Zink COMPANY

4401 S. PEORIA TULSA, OKLAHOMA

Which star field is on our new flag?



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You can be sure of getting the genuine article every time when you buy chemicals made by Wyandotte! Product line of uniform quality, including materials for drilling muds, gas dehumidification, demulsifying, emulsifying, secondary recovery, water treatment, cementing, sweetening and many other petroleum, refinery, and petrochemical applications. Get full details from your distributor, or write: *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also, Baton Rouge, Louisiana. Offices in principal cities.*

ANSWER: Our new flag becomes official on July 4, 1960. The panel at the lower left shows how the stars will be arranged.

WYANDOTTE CHEMICALS

Wyandotte CHEMICALS

MICHIGAN ALKALI DIVISION

PACING PROGRESS WITH CREATIVE CHEMISTRY

SODA ASH • CAUSTIC SODA • BICARBONATE OF SODA • CALCIUM CARBONATE • CALCIUM CHLORIDE
CHLORINE • MURIATIC ACID • HYDROGEN • DRY ICE • GLYCOLS • SYNTHETIC DETERGENTS
SODIUM CMC • ETHYLENE OXIDE • ETHYLENE DICHLORIDE • POLYETHYLENE GLYCOL • PROPYLENE OXIDE
PROPYLENE DICHLORIDE • POLYPROPYLENE GLYCOL • DICHLORODIMETHYLHYDANTOIN • CHLORINATED SOLVENTS
OTHER ORGANIC AND INORGANIC CHEMICALS

production of the test gage—which is available in capacities from 60 to 15,000 psi.—to illustrate the more than 100 sq. in. of panel space saved over many other gages in installation. Source: **Martin - Decker Corp., 3431 Cherry Avenue, Long Beach 7, Calif.**

Pump literature

. . . contains pump descriptions, dimensions, application data, and performance characteristics. Tradenamed AquaLine, the split-case pumps can be obtained in both packed and sealed types in sizes from 1½ through 4-in. discharge. Bulletin B-2100 notes that the packed type is also available through 8-in. discharge. Source: **Peerless Pump Div., Food Machinery & Chemical Corp., 2005 Northwestern Avenue, Indianapolis.**

PVC plastic pipe

. . . fittings and valves are detailed in a new handbook. Specifications, design, and installation information is included as well as a comprehensive corrosion-resistance comparison chart for seven types of plastic pipe carrying 162 chemicals.

The free, 36-page handbook also offers other charts showing: (1) peak operating pressures for polyvinyl chloride pipe at various temperatures; (2) friction - loss characteristics of water flow through pipe; and (3) flow of natural gas showing pressure drop in psi. per 1,000 ft. of PVC pipe. Source: **Kraloy Plastic Pipe Co., Inc., 4720 East Washington Boulevard, Los Angeles 22.**

Mist-eliminator

. . . comparison chart gives density, style, and use of wire-mesh entrainment separators, mist eliminators, and demisters. Style numbers and type names used by manufacturers of these products are listed, allowing comparison of density and mesh structure to be made. The chart shows style numbers for various conventional and special-purpose meshes. Source: **Schuyler Mfg. Corp., 84 Porete Avenue, North Arlington, N. J.**

Lightweight-pipe

. . . catalog has just been published to help pipe users. Available gratis upon request, eight-page Catalog 59 covers pipe, fittings, flanges, and connections.

Data includes: (1) specifications for Lockseam Spiralweld pipe in sizes from 4 to 30 in. in diameter; (2) illustrated data on one-piece Wedgelock

Now there's a New "Jeweled" Escapement in ROCKWELL CHART DRIVES

for greater accuracy and longer life

This jeweled movement brings fine watch quality to instrument timing

SPEED CHANGING TURRETS PROVIDE SEVEN DIFFERENT ROTATION RATES

The basic Rockwell Chart Drive has a main arbor rotation rate of 7 days. Economical snap-on turrets permit changing to 8-day, 15-day, 16-day, 24-day, 30-day, 31-day, and 24-hour rotation. No tools or special skills are required. You can even change chart rotation without removing the drive from the instrument.

The introduction of a jeweled movement—the first ever used on a general industrial timing device made in the United States—makes the Rockwell more accurate than any unjeweled chart drive could possibly be. In addition to offering fine watch quality, the jeweled escapement requires less power to operate and is extremely durable, since seven hard jewel surfaces are provided to limit friction and wear.

You will benefit in many ways by using these jeweled movement chart drives for powering all your recording instruments. They adapt readily to fit into practically any instrument case while speed-changing turrets (see left) permit changing rotation rates at will. Write for full information. Rockwell Manufacturing Company, Instrument Division, Pittsburgh 8, Pa.

JEWELED CHART DRIVES

another fine product by

ROCKWELL

Maintain
Coating Application
Standards

INSPECT WITH A
TR
HOLIDAY
DETECTOR!

EP HOLIDAY DETECTOR
Portable, "damp-climate," pulse type holiday detector for coated surfaces.

To obtain maximum protection and hold maintenance costs to a minimum, inspect protective coating with a Tinker & Rasor Holiday Detector and make repairs before backfilling. Minutes spent inspecting the pipe with a Tinker & Rasor Holiday Detector while the ditch is open can save days making repairs later on. Clearly, if protective coating is desirable, the best possible protective coating is *most* desirable.

Every holiday in your protective coating increases the current requirements of cathodic protection. The result is constantly increasing maintenance costs.

Insure your pipeline's future with inspection by Tinker & Rasor Holiday Detectors. Write today for technical data and bulletin.

Engineering Note:
To insure a successful application, your specification should include TR Holiday Detector inspection. Write for specification guide.

DISTRIBUTORS:
Falcon Line Products Corp., Kearny, New Jersey
Crutcher-Rolfs-Cummings, Inc., Houston, Texas
Remco Manufacturing Co. Inc., Tulsa, Oklahoma
Bob Herrick, New Cumberland, Pennsylvania
Canadian Equipment Sales & Service Co. Ltd., Edmonton, Alberta, Canada
Export Agent: Frazar & Hansen Ltd., San Francisco, Calif.

Quality control for coating application
TR TINKER & RASOR
417 Agostino Road, P.O. Box 281 • San Gabriel, California

couplings and other types of connections; and (3) conventional fittings for lightweight pipe and welding flanges for Naylor pipe. The publication also presents ordering information and uses in different industries. Source: **Naylor Pipe Co., 1230 East Ninety-second Street, Chicago 19.**

Packaged compressors

. . . in 100-500-hp. sizes for gas gathering are detailed in a new eight-page bulletin featuring the construction and operating advantages of Types AM/2 and AM/4 compressors. Bulletin 91 discusses the incorporation of large compressor concepts in these compact units.

Construction details are given on both the two-throw and four-throw type, covering the complete horsepower range. Source: **Cooper-Bessemer Corp., Mount Vernon, Ohio.**

Voltmeter

. . . features are described in a bulletin which specifies its applications—such as measuring the regulation of power supplies, the resolution of potentiometers, and the linearity of amplifiers. The two-page literature includes specifications and a schematic diagram of the unit. Source: **Southwestern Industrial Electronics Co., P. O. Box 22187, Houston 27.**

Analog-computer

. . . control systems are presented in a new six-page folder just issued. The literature describes the entire system, including solid-state controllers with operational magnetic amplifiers, interchangeable components, remote-control stations, and central patchboard networks that interconnect the system.

Diagramed Bulletin MSF-163 suggests numerous applications with emphasis on centralized plant or multiplant control, the expansion of existing control facilities, systems requiring direct tie-in with data processing or digital-computer equipment, and other process-control functions. Source: **Controls Div., Hagan Chemicals & Controls, Inc., Hagan Building, Pittsburgh 30.**

Valve booklet

. . . contains technical data, construction details, dimensions, materials, operating principles, and how-to-order information. The 4-page literature outlines details of relief, shutoff, plug, and custom valves. Source: **Circle Seal Products Co., Inc., 2181 East Foothill Boulevard, Pasadena, Calif.**

ANALYSIS

Expert Analysis of the financial requirements of the petroleum industry in development and production are yours at Republic Bank . . . a leader in petroleum financing, with the South's largest Oil Department. Analyze *your* requirements . . . and let Republic's Oil Department petroleum specialists help you plan your oil operations for maximum returns. It pays to finance at Republic!

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FASTEST GROWING
Oil and Gas Field
PROCESSING EQUIPMENT
Company in the U.S.
The NEW Expanded
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TANK AND MANUFACTURING CO.
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CANADIAN DISTRIBUTOR: Maloney-Crawford Tank and Service Co., Edmonton, Alberta, Canada
SALES OFFICES: HOUSTON • DALLAS • FT. WORTH • MIDLAND • DENVER
BRANCH STOCKING POINTS: New Orleans, Lafayette, Houston, Corpus Christi, Sterling, Great Bend, Liberal, Plainview, Farmington, Odessa, Hobbs, Oklahoma City, Nocona, Jacksboro.

TANK CLEANING

- **CLEANING PRODUCTS TANKS**
- **OIL TREATING (On location when desired)**
- **TANK REPAIR**
- **YOUR B. S. & W. IS OUR BUSINESS We will purchase your B. S. & W.**

Ask for our estimates

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▶▶▶ Equipment Men Notes

Western Co. district begins

... operations in serving the Anadarko Basin of Northwest Oklahoma and South-Central Kansas. The service district is located near Woodward, Okla., under the supervision of District Manager Julius Carver, former sales engineer at Western's Liberal, Kans. district.

Western will provide nuclear logging, perforating, fracturing, and acidizing to a large area of the Basin, according to C. E. Wooldridge, Oklahoma City division manager.

Dillard R. Thomas becomes

D. R. Thomas

... administrative assistant to the sales manager of Reed Roller Bit Co., reports W. E. Scarborough, domestic sales manager. Thomas began with Reed in Houston 9 years ago and served successively as a draftsman and engineer, and as a field engineer in Houma and Odessa.

In July 1958 he joined Kendavis Industries, Inc., where he held the position of drilling engineer. Thomas served in this capacity prior to his recent association with Reed.

Schlumberger assigns three

...—T. E. Obenchain, C. R. Ferguson, and J. W. Reinders—to new field locations. Obenchain, former field enginer at Rock Springs, Wyo., has been promoted to sales engineer and transferred to Billings, Mont. Ferguson moves to a sales-engineering post at Fort Morgan, Colo., from Cortez, Colo. He formerly served as field engineer at the firm's Cortez office. Reinders has been transferred to Lubbock, Tex., where he will fill the position of location manager.

P. B. Martin named to represent

... Liberty Mfg. Co. of Texas in the Oklahoma-Kansas district. Martin has had 24 years experience in the oil and supply industries, having been employed by Sinclair Oil & Gas Co., Republic Supply Co., and Sooner Pipe & Supply Co.

I. H. Grancell Co. acquires

... three new sales representatives for the Louisiana area, reports W. H. (Bill) Sefton, sales manager. Named were: H. Eugene Thomas, New Orleans; Harry Croom, Houma; and Jimmy Newton, Lafayette.

Sefton further announced that C. B. Holder has been appointed a midwestern sales representative, taking care of oil-drilling activities in Illinois, Indiana, Kentucky, Michigan, and Ohio.

Harold Bottomley is retained

... as a consulting engineer on a long-term contract by Treco Construction Division of Vitro Engineering Co., formerly Refinery Engineering Co. A Treco vice president from 1947 to 1953, he has been connected with petroleum refining and allied industries for more than 25 years.

Ae Treco, Bottomley moved up from chief process engineer to vice president in charge of process design, estimating, and sales. He left the company to become a consultant, and since has served in that capacity with several refining, chemical, and petrochemical firms.

Morris and McCall promoted

... to assistant vice presidents by directors of the First National Bank & Trust Co., of Tulsa. W. L. Morris and A. D. McCall, both petroleum engineers in the bank's oil-loan department, joined the concern in 1957. McCall previously was a petroleum engineer with Shamrock Oil & Gas Corp., in Amarillo, and Morris formerly was producing supervisor for Magnolia Petroleum Corp., in Tatum, N. M.

FWD Corp. consolidates two

R. W. Moellinger

... of its sales departments, according to G. F. DeCoursin, marketing vice president. Heading the new single department will be R. W. Moellinger former western manager of FWD's defense and special-products section. Prior to joining the corporation in 1958, Moellinger was project administrator for Beech Aircraft Corp., of Wichita.

John H. Caldwell takes over

... as Nicolet Industries, Inc.'s southwest district sales manager in charge of pipeline-felt sales. Territory under Caldwell's supervision includes all of Texas, New Mexico, Oklahoma, Kansas, Arkansas, Louisiana, and Mississippi.

Gerald Pope advanced to veep

... in charge of sales of J. B. Beaird Co., Inc. He has been with Beaird's sales department for 13 years.

Prior to his recent promotion to general sales manager, Pope was district sales manager of the Houston office. He started his career with Beaird at the Shreveport office where he was manager of contract and LP-gas-equipment sales. Prior to joining Beaird, he served 5 years with Texas Power & Light Co.

Keith McCarley joins

... Tyson Smith Co. as manager of the Corpus Christi district where he will direct sales and service operations in South Texas, including coordination of the firm's branch-office activities in McAllen.

Prior to joining Tyson Smith, McCarley was with Union Tank Division of Butler Mfg. Co., serving in branch managerial posts in Texas and Oklahoma. In 1948 he was named the company's outstanding salesman of the year.

Sales representatives named

... to expand field service of Southwestern Pipe, Inc., in West Texas, New Mexico, Oklahoma, and Kansas.

Ralph Hickey has set up offices in Tulsa to cover Oklahoma and Kansas for Southwestern's Lightwall electric resistance-weld line pipe. Hickey was formerly with L. B. Foster Co. in Houston.

Morris Varnadore, former independent oil operator, is located in Midland, Tex. He will serve West Texas and New Mexico.

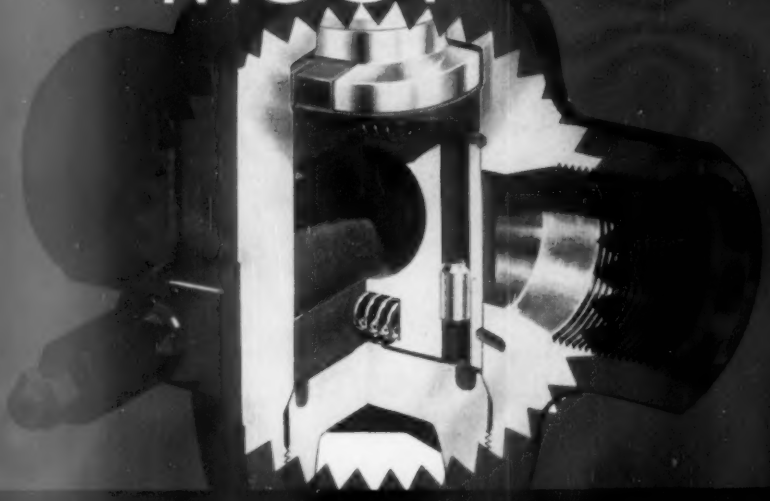
Go-Western Service is formed

... in Bakersfield, Calif., as a wireline service company offering perforating and logging services. The new company is an association of Go Oil Well Services, Inc., Fort Worth, and Western Wireline Services, Bakersfield. Announcement of the company was made in a joint statement issued by officers of both companies.

I. H. Grancell Co. assembles

... all of its national representatives for a sales workshop meeting at the company's Dallas plant. Representing the company were Robert N. Ouenell, Grancell's general manager,

GET THE MOST



THE MISSION VALVE THINKS FOR ITSELF TO SEAL AUTOMATICALLY

Not only is the Mission Valve always ready to seal, but the higher the pressure the tighter the seal. Line pressure forces Mission sealant through two semi-circular grooves around the downstream port, sealing like a plastic packing, to form a gas tight seal. Leaks are stopped *automatically* before they start. **The complete line** of 315 Mission Valves brings the positive advantages of easy opening and tight sealing to practically all valve applications. This wide selection, the Mission Guarantee, and the Mission Renewal Policy combine to make Mission Valves your best buy. Specify Mission and eliminate your valve problems.

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VALVE AND PUMP CO.

MISSION VALVE AND PUMP CO. *a subsidiary of* MISSION MANUFACTURING CO.
P. O. Box 4209, Houston, Texas cable address "MISSCO" · *export office: 30 Rockefeller Plaza, New York*

W. H. (Bill) Sefton, sales, and Byron Rothpletz, Dallas plant manager. Topic of discussion centered around the introduction of new products, as well as an exchange of ideas on regional sales problems.

Iverson Supply Co. announces

. . . the following promotions: M. C. Niblack, named vice president of sales with headquarters in Tulsa; E. L. Lambert, vice president of store and field operations, locating in Midland; and Wayne Wallace, district manager of the Farmington-Cortez district with headquarters in Farmington, N. M.

Rudy P. Lowe is named director

. . . of industrial-systems sales for B-I-F Industries, Inc., according to William L. Sammons, general sales manager of the Providence, R. I., company. Lowe will have full responsibility for industrial systems incorporating Builders-Providence, Omega, as well as Proportioneers products — blenders, meters, feeders, controls — as offered for positive control of materials in motion.

The new director has been with B-I-F since 1932 when Proportioneers, Inc., of Chicago, became affiliated with B-I-F and moved to Providence. He continues as president of the company's Proportioneers Division.

Oakite Products, Inc. names

. . . Warren W. Homeyer to the company's St. Louis technical service staff. Homeyer, a sales engineer in St. Louis, recently completed an 8-week training program at Oakite's New York laboratories and in the field.

United Supply & Mfg. Co. opens

. . . a new oil-field supply store in Atwood, Kans., to serve drilling and producing activity in Northwest Kansas, Nebraska, and eastern Colorado.

Geo. Brown

George Brown has been named store manager; B. D. (Billy) Dunn, field salesman; and Gene Bennett, floorman.

Dugald B. Roy is appointed

. . . district sales engineer for the Instrumentation Product Group of Texas Instruments, Inc.'s Geosciences & Instrumentation Division. The announcement comes from O. F. Henning, Industrial Products sales manager.

Prior to joining TI, Roy was with Cutler-Hammer, Inc. for 8 years as a sales engineer. He will locate at TI's Garden City, Long Island sales offices and will cover all of New England.

Hubner & Mayer is appointed

. . . a licensee to manufacture, sell, and service gate valves of W-K-M Division of ACF Industries, Inc. B. J. Gross, W-K-M's marketing vice president, said the complete line of API and ASA through-conduit gate valves will be manufactured by the Vienna, Austria firm. The division now has foreign licensees in Austria, France, Great Britain, and Mexico, with additional sales offices in Germany, Italy, and South and Central America.

Dow offers service in Holland

. . . by its subsidiary, Nederlandsche Dow Maatschappij N.V. at Rotterdam, Otland. C. B. Branch, vice president and manager of overseas operations, said the service will provide chemical cleaning of boilers, heat exchangers, piping systems, and other equipment.

Industrial cleaning service has been offered by The Dow Chemical Co. through its Dowell Division in the United States and Canada for about 20 years. The service, which has been expanding steadily over the years,

Experience

BUILDS A BETTER SUCKER ROD

W.C. NORRIS SUCKER RODS

Write for complete Sucker Rod Bulletin

W. C. NORRIS, MANUFACTURER
DIVISION OF DOVER CORPORATION
P. O. BOX 1739 • TULSA, OKLAHOMA
BRANCHES: Great Bend, Kansas; Corpus Christi, Houston, Kilgore, Odessa, Wichita Falls, Texas; Oklahoma City, Oklahoma; Salem, Illinois; Casper, Wyoming; Farmington, New Mexico; Edmonton, Alberta, Canada.
NORRIS QUALITY SUCKER RODS POLISHED RODS . COUPLINGS
Buy From Your NORRIS Distributor

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was recently taken over by the newly formed Dow Industrial Service Division.

Norman G. Kirkland is named

. . . area manager of refinery and pipeline sales of U. S. Steel Corp.'s Oil Well Supply Division, reports D. D. Grubbs, the division's California area manager. Kirkland will locate in Los Angeles. He has been an Oilwell employe for more than 11 years.

B-I-F Industries, Inc. forms

. . . eastern, central, and western regional operations for its U. S. and Canadian field sales organization, according to W. L. Sammons, B-I-F's general sales manager.

Douglass Taber directs the eastern region with headquarters in New York City. The central region is headed by Paul A. Coffman, Jr., who locates in Chicago. The western region is supervised by Edward F. Morey, Jr., with offices in Dallas.

Jan Oostermeyer is chairman

Jan Oostermeyer

. . . of the board of directors of Permanent Filter Corp., of Los Angeles. He is the former president of Shell Chemical Corp. The board also appointed Dan S. Mortensen as chief administrative officer and elected him a director.

Oostermeyer began his association with Shell in 1937. He served in various capacities until 1946 when he was named president. Oostermeyer retired from this post in 1953 and since then has served as a consultant to various companies.

Coors Porcelain Co. announces

. . . that a new sales-engineering office has been set up in Dallas, with Kenneth R. Lundy named as regional sales manager. The office rounds out Coors sales-engineering coverage of basic marketing areas in the U. S. for high-strength industrial ceramic. In six areas, the company now offers advantages of direct, on-the-spot ceramic design-engineering service.

Petrochimie S.A. is licensed

. . . by Pipe Line Development Co. through American Premaberg Co. to manufacture its line of pipeline repair sleeves, couplings, clamps, and flanges in France and the French colonies and possessions.

PIPE-PROTECTION TAPE known as Scotchrap is used to cover the welded joints of a 7-mile steel pipeline recently constructed in England. The tape aids in protecting joints against both chemical and electrolytic corrosion. The pressure-sensitive tape (20-in. wide) was used for this application. Manufactured by Minnesota Mining & Mfg. Co., Scotchrap is said to give positive insulation and protection quickly, safely, and easily. A polyvinyl chloride self-adhesive tape, the pipe insulation is also highly resistant to puncture or fungus attack.

Albert J. Kayser becomes

. . . a sales engineer in Texas, Louisiana, and Mississippi for Detroit Controls Division of American-Standard, announces A. L. Fuller, divisional sales manager. Kayser's headquarters will be in Dallas. For the past year he has been a sales engineer with Hussman Refrigeration, Inc., Dallas.

Dunwoody Pipe & Supply moves

. . . into line-pipe sales and appoints E. Cary Link, Jr., to head up the new division. In addition to serving as line-pipe sales manager, Link will direct a new pipe coordination service, assisting pipeline companies in disposing of surplus inventories. Link had been vice president of Jess Edwards, Inc., pipeline hauling and stringing company, for 3 years prior to joining Dunwoody.

Bethlehem Supply Div. expands

. . . its Tulsa manufacturing facilities to include production of Bethlehem duplex and triplex general-purpose pumps. C. R. Zimmerman, vice president, stated that the new facilities will augment the present production of the Bethlehem oil-well pumping unit. He further stated that initial shipments of pumps are under way.

Cooper-Bessemer launches

. . . a major expansion program in Canada, according to Eugene L. Miller, president of the Mount Vernon, Ohio manufacturer. Through its wholly-owned subsidiary, Cooper-Bessemer of Canada, Ltd., C-B will begin manufacturing operations in a plant leased from the Canadian National Railways at Stratford, Ontario.

Since 1949, Cooper-Bessemer of Canada has served as a marketing organization with warehouse and service facilities. The opportunity to manufacture in Canada came about through the availability of the railroad plant which consists of buildings, cranes, and machine tools suitable for construction of heavy equipment.

Plans call for the immediate use by the corporation of some 60,000 sq. ft. of the 200,000 sq. ft. facility. The firm now has five manufacturing plants.

Don Fisher, Sonny McCurry go

. . . to the sales-engineering staff in Houston of Tyson Smith Co., according to Ray Jones, executive vice president.

Before joining the Smith organization, Fisher was with Maloney-Crawford Co. as a sales engineer and Mid-Continent Supply Co.—Delta Tank Division, serving in various South Texas, New Mexico, and Louisiana locations. McCurry served as a sales and service engineer for Weatherford Oil Tool Co. until going with Tyson Smith.

L. J. (Joe) Conner becomes

. . . manufacturers representative for Herb J. Hawthorne, Inc., reports W. A. (Bill) Davidson, sales manager for the Houston-based exploration-bit-manufacturing firm. In his new position Conner will maintain contact with the company's customers in the field, and with authorized Hawthorne dealers throughout the Western United States. With the Houston concern since 1949, Conner worked up to his present position through the company's home office shipping and telephone sales departments.

John R. Curran is named

. . . divisional vice president and general manager of Hammel-Dahl/Foster Engineering Division of General Controls Co. Now in charge of all division engineering, production, and sales activities, he was formerly Hammel-Dahl/Foster's vice president in charge of engineering.

Curran joined Hammel-Dahl Co. in 1945 as chief design engineer. When the company was purchased by Gen-

eral Controls 2 years ago, he was a member of Hammel-Dahl's board of directors and vice president in charge of engineering and sales.

Tuboscope Co. to set up

. . . a district sales and service office in Kilgore, Tex., under the management of J. C. Myrick. The newly established district will be under the direction of Tuboscope's Houston division.

J. R. (Dick) Yancey is promoted

. . . to vice president of Oil Center Tool Co., announces Al Woff, president. Yancey, whose background of oil-field-equipment experience dates back 30 years, will continue to serve in his current role of chief engineer. He was first associated with Gray Tool Co. and resigned after 13 years with the title of vice president in charge of engineering and manufacturing. Yancey then served the same number of years with A-1 Bit Tool Co., and there also was vice president in charge of engineering and manufacturing. He began with Oil Center Tool Co. in 1956 as a research and development engineer and was named chief engineer in September 1957.

J. R. Yancey

Oil Well Supply appoints two

. . . new city representatives, reports M. F. Jones, Gulf Coast area manager of the division. Robert F. Horton takes over in Houston while Robert L. Kelly assumes the post in New Orleans.

Horton was employed by U. S. Steel Corp.'s Oil Well Supply Division in 1952 at El Dorado, Ark. He was transferred to the U. S. Steel Audit Division in 1955 where he served until the present.

Kelly began with Oilwell at Beaumont in 1945. Three-years later he was shifted to Houston, and from there to Corpus Christi as district representative.

Stone & Webster announces

. . . the election of T. Cortlandt Williams, president since 1955, as chairman of the board. And Fred W. Argue, executive vice president, was elected president to succeed Williams.

Other management changes include the election of Alfred L. Hartridge, financial vice president and treasurer, to executive vice president; and of Dr. Arthur J. Good, vice president and comptroller, to vice president and treasurer.

Stone & Webster Engineering Corp. is engaged in the design and construction of power plants, petroleum refineries, chemical plants, nuclear facilities, and industrial installations in various parts of the world.

Crane Co. announces plans

. . . to acquire Swartwout Co., Cleveland manufacturers of electronic-control equipment. Immediate plans call for Swartwout to be operated as a division of Crane, without any basic changes in marketing policy. Operation of the Swartwout business will continue under guidance of Kenyon Swartwout and Charles Swartwout.

Stewart & Stevenson announces

. . . the completion of a new building adjoining the company's home office in Houston. According to E. E. Childress, operations manager, increased engineering facilities were required in connection with GM Diesel's recently expanded line and an increasing demand for complete fabrication of custom-designed equipment of various types. Stewart & Stevenson Services, Inc., is GM Diesel engine distributor for Texas.

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PACKAGED, AUTOMATIC STEAM GENERATORS . . .

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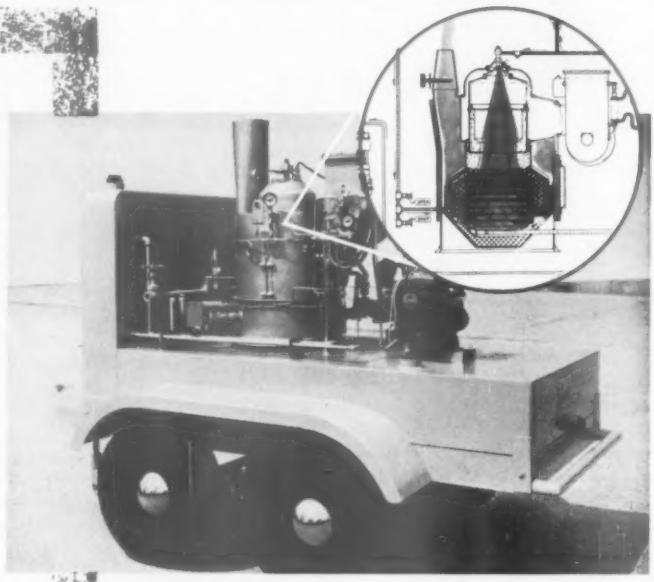
TEX-Steamers in all sizes are easily mounted on truck, trailer or skid for mobile use. Packaged design, automatic operation, no pressurized hot water reservoir make steam generation safe and economical under all field conditions.

Contact your Texsteam representative for full information on TEX-Steamers — HP ratings from 10 to 125, standard working pressure range: 75 to 600 psi. Higher steam outlet pressures on application.

May we forward our detailed TEX-Steamer Bulletin No. 100C?



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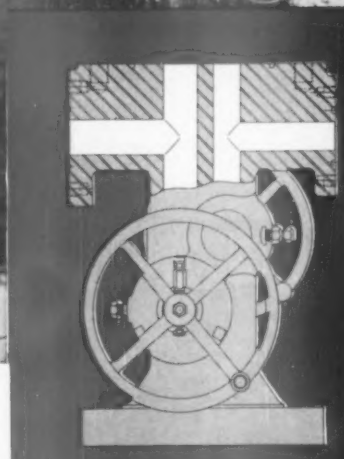

W-K-M Cross-Type Multiple Completion Valves feature through-conduit gate construction, Teflon seat inserts for Double Tight sealing, pressure seal bonnets, superfinished stems supported on roller bearings, seating surfaces sealed from the lading flow. They can be overhauled on the line.

Sizes: 1¾" and 2"

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Smith threaded flow nozzle sectioned to illustrate o-ring seal and general construction.

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RUGGED TERRAIN of Kentucky is backdrop for this rotary rig.

Rotary digs deep in Kentucky

AN ACTIVE rig working in Pike County, Kentucky, has drilled 14 wells since it arrived earlier last year.

Now on its fifteenth location, this equipment belongs to Ray Brothers Drilling Co. of Charleston, West Va. Under contract to United Fuel Gas Co., the rotary has been working in the 5,000 to 6,000-ft. range. Ray Brothers is owned by James and Rex Ray.

An influx of rotary equipment has been prevalent in the cable-tool domain of Kentucky.

Joint API-AAODC Committee rules

RULES and regulations which will govern all future procedures and activities of joint API-AAODC study committees have been formally approved by both the API and the AAODC. This is an important development. Whereas such joint activities in the past have been on a very loose hit-and-miss basis, these new regulations provide definite procedures and definite means for servicing the joint studies. These should result in improved operations.

The API approved the regulations during its annual meeting in Chicago. The AAODC approved the regulations during its board meeting.

A six-man committee has been established. It is known as the API-AAODC drilling-practice coordinating committee. Three representatives from each association comprise this committee.

All proposals for joint studies are to be made to either the AAODC rotary drilling committee or the API steering committee on drilling practice. If either of these two groups approve the project the proposal then goes to the API-AAODC drilling-practice coordinating committee for final approval. The joint committee will establish rules for the guidance of all joint studies, and also has the responsibility of assigning the project to one or the other of the associations for administration.

Oil etiquette book is published

New Mexico Oil and Gas Association has just published a booklet of etiquette in relations between ranchers and other land owners and oil and gas

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Low-Cost
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popular sizes

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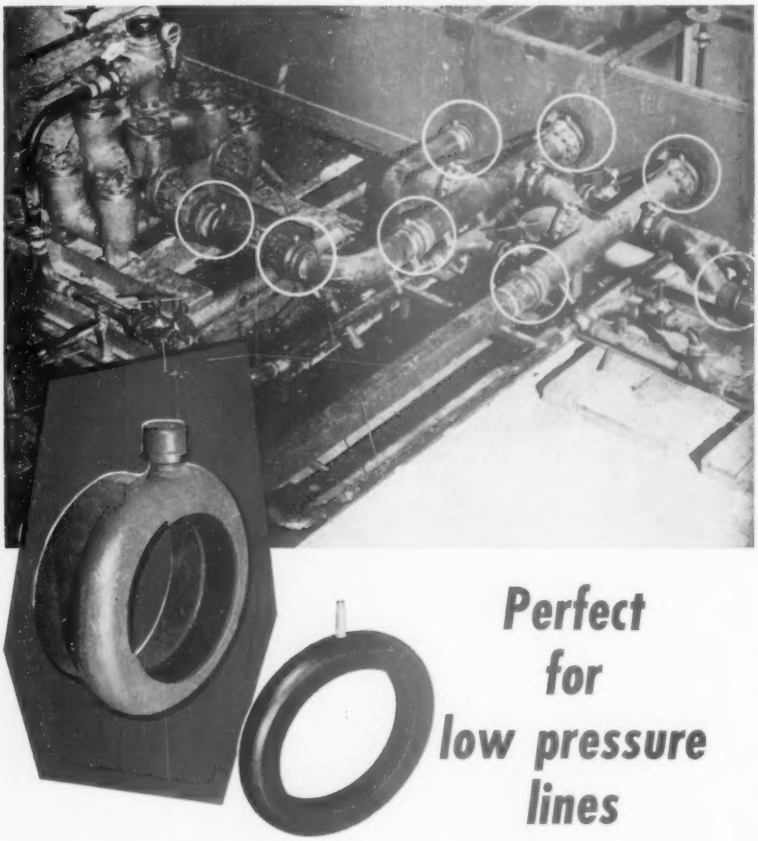
WECO AIR-O-UNIONS



Perfect for low pressure lines

WECO Air-O-Unions have everything you want in quick, easy make-up, perfect sealing unions for low pressure lines, such as mud suction and return lines; for connecting mud tanks and other services where fluid pressures are low.

No bolts, nuts or wrenches are required. No close line-ups are necessary. Just a shot of air seals the inflatable tube . . . deflating it releases the seal for break-out.

With WECO Air-O-Unions permanently welded in place on your mud tanks, suction and return lines and fittings, mud systems are set up with less time, trouble and cost than ever before. Switch to low cost, time-saving, simple Air-O-Unions on all of your low pressure lines. They are available in sizes 6" through 16".

Your Supply Store has WECO Air-O-Unions . . . or ask your WECO or Chiksan representative.

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operators working on federal lands.

Outlined in the booklet are the duties and obligations of all parties working on the land at the same time. A code of ethics is set down for oil and gas operators on conducting exploration, drilling, production, and pipeline operations.

New shallow rig unveiled

A DEMONSTRATION of the new model shallow FP3 rig was presented in Tulsa on January 6 at the Standard Industries, Inc., quarry by George E. Failing Co., Enid, Okla. Attending were industry representatives and Failing managers from throughout the United States.

The new truck-mounted rig, rated to 2,000 ft., is equipped for either air or mud drilling and features a 30,000-lb. chain pulldown, retractable rotary table, air controls, 10-speed transmission, 2-speed draw works, and hydraulic leveling jacks.

Controversial well started

THE FIRST wildcat well is scheduled to start shortly on the fashionable Brentwood Country Club in the Los Angeles city limits. Effort will be General Petroleum Corp. 1 Brentwood C. C. located in 32-1s-15w.

The residents of the neighborhood lost a bitterly fought battle opposing oil wells in their area. Haney & Williams Drilling Co., Long Beach, is the contractor for this Los Angeles County venture which will be drilled near the intersection of Twenty-sixth and Montrose streets. A fully soundproofed rig will be used.

Course slated

PLANS are progressing by the American Association of Oilwell Drilling Contractors to hold a 4-week training program and School of Drilling Technology at Louisiana Institute at Lafayette. A special committee of operating-company drilling personnel and drilling-contractor personnel has been working on the basic outline of this school.

Carl A. Kinney of Atlantic Refining Co. is the committee chairman. The school is aimed at drillers, crewmen, and tool pushers. It will be one of four training programs that the AAODC has established and will cover basic fundamentals of drilling.

LARKIN

Larkin Double-Bow Centralizers, in both Slip-On and Lok-On Types, are furnished in five different ranges to suit any casing/hole size condition. Larkin Double-Bow Centralizers in the properly selected range will provide the absolute optimum in "engineered" centralizer performance. Available through your supply store.

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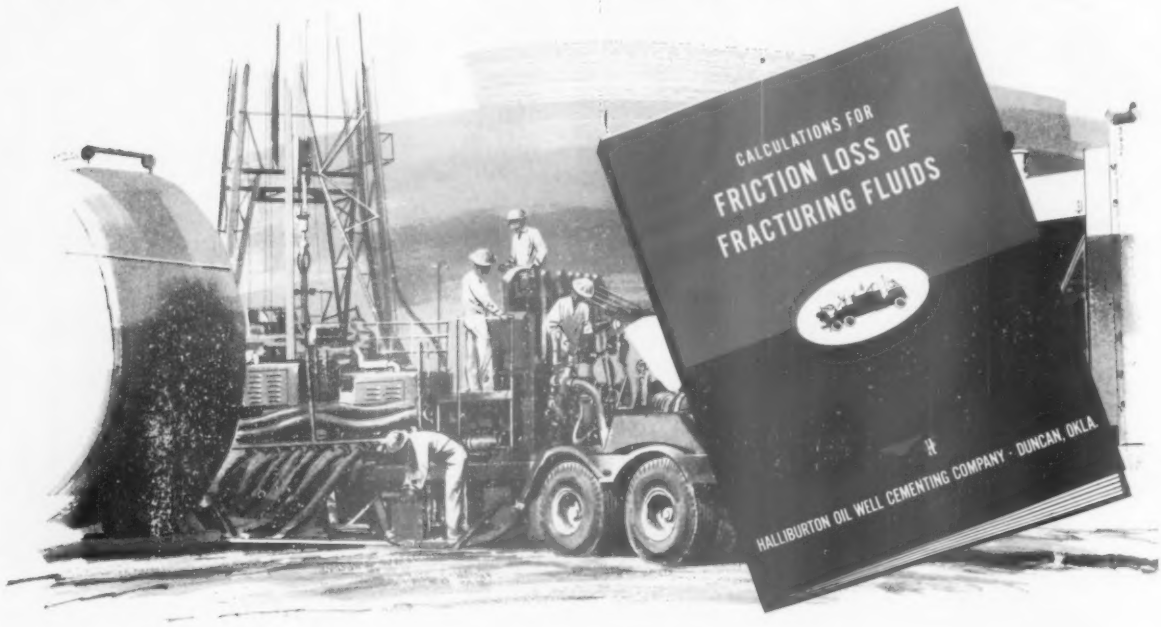
LARKIN LEADERSHIP HAS BEEN EARNED BY YEARS OF DEPENDABLE PERFORMANCE

Another FIRST from Halliburton

PRE-CALCULATED FRICTION LOSS DATA

. . . to help you with *faster* determination of Pressure Drop and Horsepower Loss due to friction in pipe



Many months ago, Halliburton Research Engineers began a project to simplify the task of calculating the amount of pressure drop and resulting horsepower loss which would be lost in a given well due to friction caused as the fluid is forced into it.

The result of their effort is this new brochure entitled "Calculations for Friction Loss of Fracturing Fluids" (for Newtonian fluids). It has already been mailed to thousands of engineers all over the world with the hope that it will help them in their design of fracturing programs.

Contained in the brochure are dozens of easy-to-read charts, tabulations and examples. Here is a partial list of the contents:

- Factors Affecting Friction Pressure
- Calculation of Friction and Treating Pressures in Pipe
- Flow Through Annulus
- Simultaneous Flow Through Tubing and Annulus
- Density vs. Sand Concentration
- Hydrostatic Pressure vs. Depth
- Effect of Friction Pressure on Horsepower
- Friction Pressure Caused by Fittings
- Friction Pressure vs. Rate

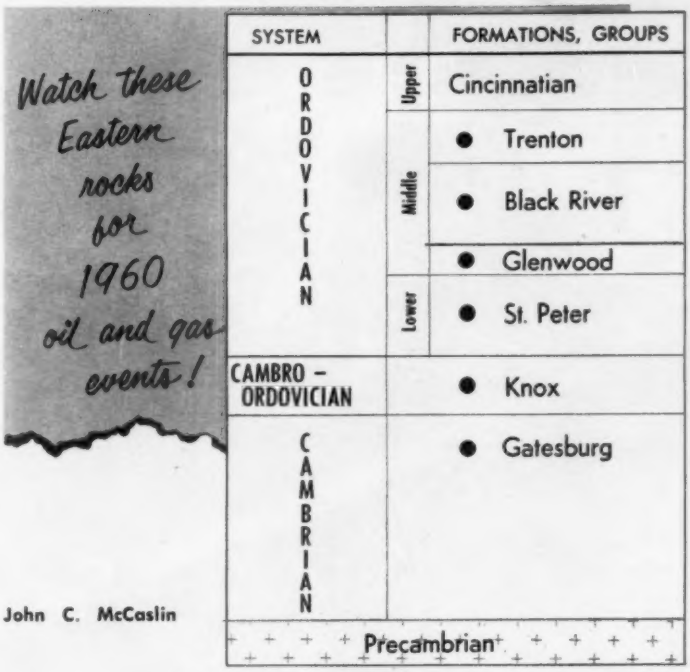
If your people haven't received their copies of this brochure, ask your local Halliburton Representative to put this time-saver to work for you. He'll be glad to supply as many copies as you need.

HALLIBURTON OIL WELL CEMENTING COMPANY • DUNCAN, OKLAHOMA

HALLIBURTON
Fracturing Services

"STILL THE PIONEER IN FORMATION FRACTURING TECHNIQUES"

Deeper drilling may tap new eastern reserves



A NEW CHAPTER in the East's long drilling history appears to be in the books after a year of record development. Formations that were once just names are now producers.

By John C. McCaslin

THERE'S NEW REGARD for the lower part of the geologic column in the eastern states and Ontario. Particular enthusiasm centers on the potential of the Cambrian, Cambro-Ordovician, and Ordovician rocks in Pennsylvania, Ohio, Michigan, Kentucky, and Tennessee.

Why the furor? . . . Recent discoveries in Pennsylvania, Ohio, Ontario, and Michigan in older rocks place new importance on an area where the drill used to stop in the Silurian or higher. Far too few wells have been drilled to deep horizons in the East in past years. Those few didn't find much oil or gas. But deep tests are becoming more than a trickle now and the East is taking its place among those areas that feel much has been bypassed in years of drilling.

. . . **The Cambrian.** Production from Cambrian in this country is limited to West Central Texas, Wyoming, Kansas, and New York. It produces a respectable amount of oil in Kansas, Wyoming, and Texas, but is known in just a few New York spots.

First Cambrian production in Pennsylvania was opened last year at an Erie County wildcat in the northwestern corner of the state. Russell McConnell 1 Borst in Conneaut Township flowed 400 M.c.f.d. from the Gatesburg-Upper Cambrian between 5,896 and 5,910 ft. Only 10 wells ever went to or through the Gatesburg in the state, so the new strike takes on considerable worth. Undoubtedly, regional operators will not laugh off the Cambrian-Gatesburg in Pennsylvania and the Potsdam and Little Falls in New York in future exploration.

. . . **The Cambro-Ordovician.** An important exploratory niche is being etched in Ohio where two discoveries set the stage for a special look into the rocks below the Trenton-Black River Ordovician. First oil production from Glenwood Cambro-Ordovician dolomite has caused a flurry of excitement in Ohio. Monk Oil & Gas Co. completed 2 J. N. Monk in Section 22, Bennington Township, Morrow County, last week for 85 bbl. of Corning-grade oil on an 11-hour test after acidization. Logs indicated shows in four pay zones—3,589-91, 3,606-17, 3,627-32, and 3,703-08 ft. Perforations were at 3,596-3,600 and 3,623-28 ft. Monk will move immediately 2,000 ft. south for a confirmation try.

This is the second deep success in Ohio of late. The search for deep production saw a dozen wildcats head for Cambro-Ordovician last year. The first hit was Ohio Fuel Gas Co. et al. 1-A F. Smith on Lot 69, Hinckley Township, Medina County. This well flowed 1,210 M.c.f.d. from 5,775-90 ft. in a dolomite sand near the Cambro-Ordovician contact. Location was made on a known "high" in shallower formations and was selected following exacting seismic work. This well was the most encouraging find yet in Ohio from formations below the Black River. As long as 10 years ago it was said in Ohio that "the sedimentary sequence below the St. Peter has been explored to a very minor extent, and various showings in scattered locales give it a fair future." The hunt was slow in the making, but with two good finds on the books we will see a much more impressive deep campaign in this decade.

More than 300 wells have gone to St. Peter and Knox in Kentucky, but the result has been just a few minor finds. Knox is widespread in Kentucky, Tennessee, and the Black Warrior basin. It produces some oil in Tennessee, and if the expected shallow play in that state begins to materialize, the Knox will be in demand.

. . . **The Ordovician.** It is in this system that most of the oil news is being made in the northeastern states, particularly Michigan and across the border in Ontario. Prime targets are the Trenton and Black River.

The Trenton never moved wildcatters' lips in years past, but Scipio, Pulaski, and other trend finds in southern Michigan changed all that. Michigan's new oil hope is the Trenton.

Last year's oil find at Colchester in southwestern Ontario will be the nucleus of a spirited wildcat march this year throughout the northern shores of Lake Erie. Trenton production is anything but new to the East, but big wells and big fields are new. It has produced for many years along the Findlay arch in Indiana, Ohio, and Illinois.

EXCLUSIVE NEW "ACID GUIDE" HELPS YOU

GET BETTER WELLS AT MINIMUM COST

Now—for the first time—a service company has developed a formal, systematic method of engineering acid treatments. The company is Dowell, and the method is the "Acid Guide."*

Using this new approach, your Dowell engineer can help you avoid treatments that are too small to get the results you want, or are unnecessarily large and expensive. He can help you select the right quantity and kind of acid and addition agents, and the preferred injection rate. Also, he can help you predict probable results from the treatment. He can do all these things when he engineers your treatment with the aid of the "Acid Guide." These three examples have been selected to show just some of the ways you may benefit when the "Acid Guide" is used:

NORTH TEXAS. In Wilbarger County, a low-cost acidizing treatment—engineered using the "Acid Guide"—increased production from a show to 12 boph flowing, on a 16/64 inch choke. The well had been completed in the five-foot Canyon lime pay at about 3870 feet. Treatment consisted of a 500-gallon spearhead of BDA* (Breakdown Acid), followed by 2000 gallons Dowell acid injected at five bpm. Results compared favorably with much larger jobs in similar wells.

OKLAHOMA. In McClain County, an operator saved $2000 in treating materials when he had Dowell engineer a treatment with the aid of the "Acid Guide."

The well had been completed into the Hunton lime in a field where the most frequent treatment was 20,000 gallons Retarded Acid (acid-oil emulsion type). The

NEW IDEAS FROM DOWELL

TO HELP YOU MAKE MORE PROFIT

ABRASIJET*

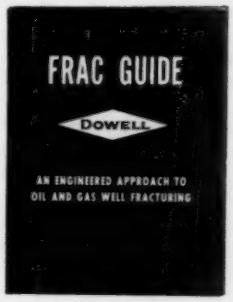
This new Dowell service employs a special multi-jet tool to direct high-velocity streams of abrasive-laden fluid against pipe or formation. The service is used to perforate pipe, reduce breakdown pressures ahead of fracturing or acidizing, and clean or enlarge bore holes. Ask about the other uses operators are finding, also.

CHANNELBAN* BALL SEALERS

These porous ball sealers are made of plastic-coated walnut shells. They resist "pump through" and cannot plug perforations completely. Since they lower the pressure differential between perforations, they reduce the possibility of channeling the cement.

"FRAC GUIDE"*

This recent Dowell development makes possible unusually precise engineering of fracturing treatments. With the aid of the "Frac Guide" it is possible to select the most economical fluid, the correct quantities of fluid and sand, the optimum injection rate. Probable results can also be predicted with relative accuracy.



"Acid Guide" was used to see if desired results could be obtained with a less expensive job.

Calculations indicated that 12,000 gallons of fluid would do as well as 20,000. The actual treatment confirmed this prediction. The well went from one boph, pumping, to 10 boph, flowing. The operator considered this result highly satisfactory.

WEST TEXAS. An experiment was conducted on a well in the Strawn lime of Midland County to check the reliability of predictions made with the aid of the "Acid Guide." After a clean-up treatment using 360 gallons of BDA (Breakdown Acid), the well tested 27 bopd. Calculations made with the aid of the "Acid Guide" indicated that maximum penetration with *regular* acid could be obtained with 2000 gallons. A 2000-gallon treatment increased production to 53 bopd. An additional 4000 gallons of regular acid gave no production increase. Then, additional calculations using the "Acid Guide" indicated that greater penetration and more production would result from a treatment using 12,000 gallons of *Retarded Acid*. Following this last treatment, the well tested 84 bopd.

Ask your Dowell representative to engineer an acid treatment for your well with the aid of the "Acid Guide." For prompt service or detailed information contact the Dowell station nearest you. Dowell has more than 150 offices and stations in the U. S., Canada, Argentina, and Venezuela. Dowell, Tulsa 1, Oklahoma.

*Dowell Trademark

Services for the oil industry

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Almost as big as 48 of the U. S.'s 50 states . . .

Australia needs oil

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THE PROVED METHODS that have found oil practically all over the world are being used in Australia today. By the time an average exploration campaign has reached the actual drilling stage, a great deal of hard work has already been done, generally over a period of years.

This has already happened in Australia. In standard sequence, field geologists, aerial mappers, magnetometer and gravity crews, and finally seismograph parties have been at work for a long time, and they have already defined many areas that should be drilled.

This set the stage for the leasing of nearly every acre with a chance for oil production. From the detailed map, it will be seen that almost all basin land in the country is already taken. It is almost too late for newcomers, no matter how large or how rich, to find a seat at the Australian oil show. There is no way to estimate what Australian acreage is worth today. Some of the companies shown on the concession map (page 136) are great majors. Others are small independents. But they have one thing in common—so far as Australia is concerned, they have tied up nearly all the land, even the offshore blocks. A further look at the detailed map discloses another important point:

Leases in Australia have been granted in large, unbroken tracts. The smallest exploration permit is measured in millions of acres. The larger ones are in the hundreds of millions of acres. Leases of this size are on the scale of whole states in the U. S.

SIR THOMAS PLAYFORD, Premier of South Australia, drove the stake marking the site of Delhi-Frome-Santos 1 Innamincka wildcat. This test in the Great Artesian basin was recently abandoned. Fig. 1.

When a company finds oil on a block of this size, there is no problem of offset wells 40 acres away. The fortunate company will have the whole oil field to itself, and any other fields found for miles around. It will be able to drain its reserves with a minimum number of wells, and at maximum economic recovery rates.

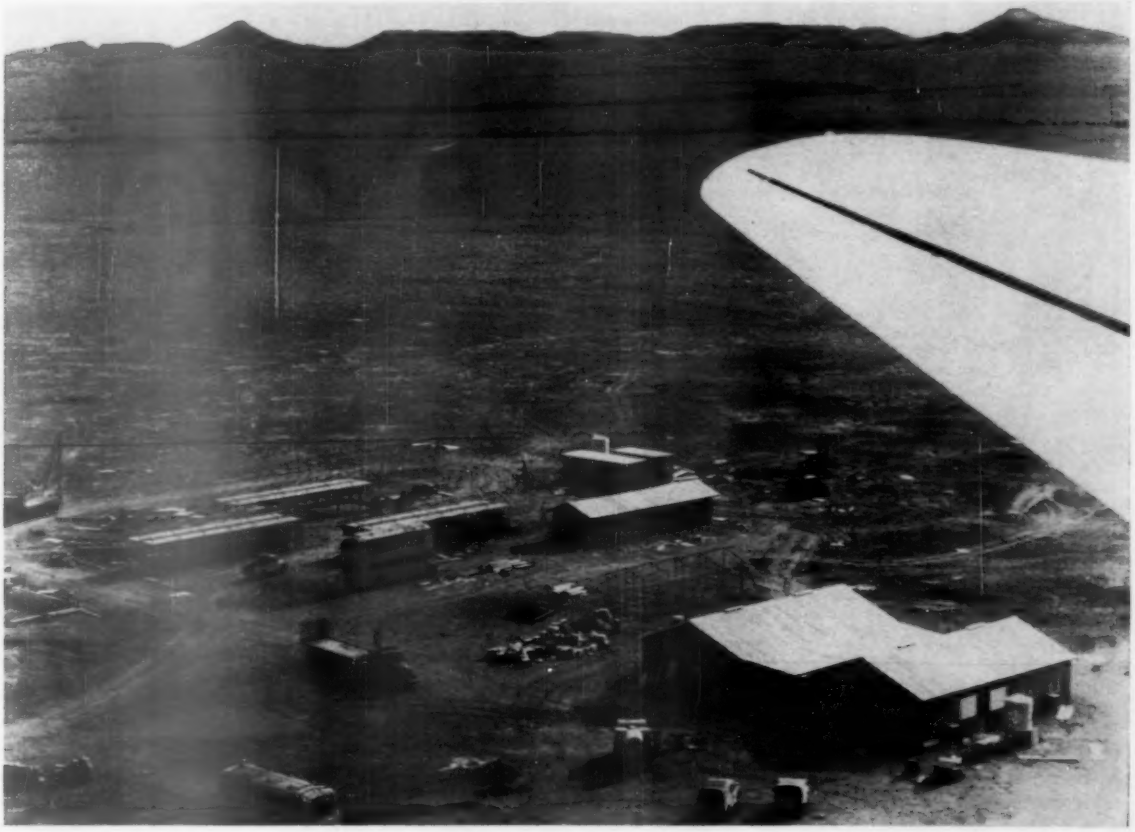
Many Reasons for Optimism

For the past 60 years or more, farmers and ranchers all over Australia have been reporting shows of oil or gas in water wells.

In the year 1900, natural gas was struck, at 3,683-ft. depth, while sinking a water well on Hospital Hill, Roma, in Central Queensland. The gas blew wild for almost 6 years, but died when harnessed to supply the town. Traces of oil were brought up by water after the blow ceased; a bridge at 3,273 ft. was not cleared and the well abandoned.

A local company, with State Gov-

EQUIPMENT waiting to be rigged up for the 1 Innamincka test. Fig. 2.



AERIAL VIEW of the campsite used during the Innamincka operation. Note the double-decker Adelaide busses. Typical terrain is seen in background. Fig. 3.

ernment assistance, was formed in 1907 to drill for oil near the first bore and struck gas at 3,702 ft. in larger volume. The flow caught fire and was not extinguished until 6 weeks later. The hole was deepened to 3,712 ft. where tools were lost and the well eventually abandoned.

In South Australia there is an old well near Patchawarra that has been standing full of water since 1924, bubbling natural gas all the while.

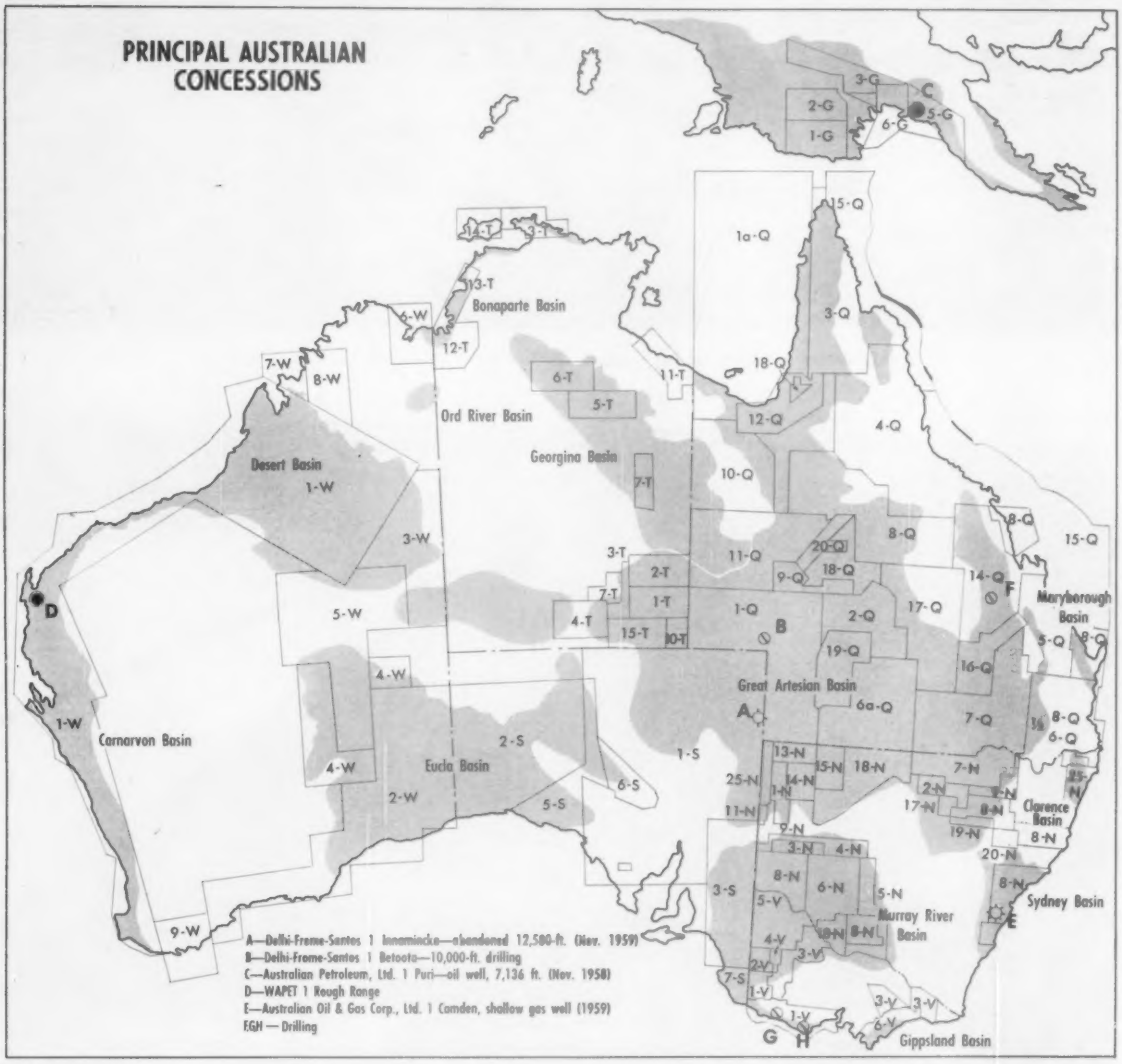
In 1953, Caltex Oil Pty., Ltd., (WAPET) found oil in the first well it ever drilled at Rough Range in West Australia (D in map). This was followed by nine dry holes, but Caltex is still drilling and intensifying its efforts on this prospect.

In December 1958, a team of U. S. and British majors completed a well near Puri, New Guinea (C in map) which produced 3,500 bbl. of oil in 3 days and then began making salt water. This well is still being tested, and offsets are being drilled. Operators are Oil Search, Ltd., (10%); Vacuum Oil Co., Pty., Ltd., (45%); and British Petr. Co., Ltd. (45%).

In March 1959, Australian Oil & Gas, Ltd., struck gas only 19 miles from Sydney (E in map). This well is shut in while the company tries to define the field.

In May 1959, the Delhi-Frome-Santos 1 Innamincka (A in map), in

Here are the Australian leases where oil companies are looking



MUCH of Australia is already under concession. Blocks vary in size from slightly under a million acres to nearly 200,000,000 acres. Fig. 4.

the heart of the Great Artesian basin, encountered the first of four oil shows reported between 4,000 and 6,900 ft. This wildcat was recently abandoned.

None of these areas has yet produced a major oil field, and this is discouraging. But this is the way many oil plays start. In Australia, oil will be found where oil has always been found—in great basins, with marine sediments, on large structural traps. The way to find oil under these conditions is to drill wells, and the ratio of wells drilled to date on Australian structures is less than one per 50,000 sq. miles.

Australia Needs Oil

Australia has every resource it needs to become a great industrial nation, except oil and gas. To correct this situation, the Commonwealth government is offering generous incentives to attract oil-exploration companies.

Multimillion-acre exploration permits have been granted at no cost except an obligation to explore the blocks which are leased.

The government claims a reasonable royalty of 10%, as compared with the customary 12½% in the U. S. and far higher percentages in such places as Venezuela and the Arab nations.

Large cash subsidies are paid to support drilling. For example, the Delhi-Frome-Santos group received a subsidy of $716,000 toward the cost of its first well. It will receive $337,500 toward its second well, the 1 Betoota, now on the way down (B in map). Other drilling companies will receive comparable help. It is hard to recall another country ever contributing hard cash toward the finding of oil within its borders.

With all this encouragement from the Commonwealth government, the oil companies are responding with men, material, and money. Yet in spite of the encouraging geology, the oil shows, and government assistance, there is an even more compelling basis for the Australian oil search.

The Australian oil market . . . The country uses about 216,000 bbl. of crude oil per day. This amounts to about $300 billion a year. Every drop

for the big strike that will open up this virgin territory

KEY TO CONCESSIONS

Block	Operator	Acreage
QUEENSLAND		
1-Q	Delhi-Taylor & Santos et al.	42,264,000
1a-Q	Delhi-Taylor & Santos	87,680,000
2-Q	Sterling Oil of Oklahoma, Inc.	12,096,000
3-Q	Plymouth Oil Co.	29,376,000
4-Q	Stekoil Petroleum Co.	52,480,000
5-Q	Nortex Oil & Gas Corp.	12,500,000
6-Q	Phillips Petroleum Co. and Sunray Mid-Continent	31,843,000
7-Q	Union Oil Co. of California and Kern County Land Co. et al.	27,520,000
8-Q	Lucky Strike Drilling Co. and Subsidiaries	50,589,000
9-Q	Coronado Petroleum Corp.	5,232,000
11-Q	The Papuan Apinaipi Petroleum Co., Ltd.	27,520,000
14-Q	Assoc. Preney Oil Fields N. L.	21,401,600
15-Q	Humber Barrier Reef Oils, Pty., Ltd.	48,228,000
16-Q	Assoc. Australian Oilfields, N. L.	8,584,000
17-Q	Magellan Petroleum Corp.	24,128,000
18-Q	Assoc. Australian Oilfields N. L. and Assoc. Freney Oilfields N. L.	9,920,000
19-Q	L. H. Smart Oil Exp. Co., Ltd.	10,112,000
20-Q	Magellan Petroleum Corp. and Central Queensland Petroleum Co., Pty., Ltd.	3,200,000
NEW GUINEA AND PAPUA		
1-G	Hackathorn Oils, Ltd.	*6,400,000
2-G	Triton Corp.	*6,400,000
3-G	Australian Petroleum Co., Pty., Ltd.	9,833,440
4-G	Island Exploration Co., Pty., Ltd.	4,124,080
5-G	Papuan Apinaipi Petroleum Co., Ltd.	5,593,600
6-G	Camelot Nominees, Pty., Ltd.	6,080,000
7-G	Enterprise of New Guinea Gold and Petroleum Development N. L.	*2,304,000
NEW SOUTH WALES		
1-N	Texas American Oil Corp.	3,200,000
2-N	Lee Evans Oil & Gas Co.	3,200,000
3-N	North Australian Petroleum Co.	3,200,000
4-N	Exploration Drilling of Australia, Ltd.	*3,200,000
5-N	Landa Oil Co.	6,400,000
6-N	J. G. Fuller	9,536,000
7-N	Union Oil Co. of California and Kern County Land Co. et al.	10,490,640
8-N	Australian Oil & Gas Corp., Ltd.	13,566,240
9-N	Sterling Oil of Oklahoma, Inc.	*6,400,000
11-N	Harver Corp., Ltd.	1,088,000
13-N	P. E. Gauld	3,051,760
14-N	Planet Exploration Co., Pty., Ltd.	*3,200,000
15-N	L. H. Smart Oil Exploration	*3,993,600
17-N	Roland Walton	*768,000
18-N	Builders Inc., Pty., Ltd.	*17,292,800
19-N	J. A. O'Shea, Nom. Composite Industries, Pty., Ltd.	*1,298,500
NORTHERN TERRITORY		
1-T	Delhi-Taylor	6,400,000
2-T	Three States Natural Gas Co. of Dallas	6,400,000
3-T	North Australian Petroleum Co.	*6,000,000
4-T	Frome Broken Hill, Pty., Ltd.	*6,400,000
5-T	Dallas Southern Corp.	*6,400,000
6-T	Texas American Oil Corp.	*6,400,000
7-T	Carl M. Loab Rhoads & Co. et al.	*6,400,000
10-T	Windfall Oil & Mines, Ltd., of Canada	4,000,000
11-T	Peter Eric Gauld	6,400,000
12-T	Westralian Oil, Ltd.	4,736,000
13-T	Associated Australian Oilfields N. L.	4,864,000
14-T	Santos, Ltd.	4,768,000
15-T	Geosurveys of Australia, Ltd.	6,272,000
SOUTH AUSTRALIA		
1-S	Delhi-Taylor and Santos, Ltd.	113,054,000
2-S	Exoil Pty., Ltd.	54,896,840
3-S	Hackathorn Oils, Ltd.	*23,000,000
6-S	Clarence River Basin Oil Exploration, Ltd.	5,696,000
7-S	General Exploration Co. of Australia, Ltd.	3,136,000
VICTORIA		
1-V	Frome Broken Hill Pty., Ltd.	8,326,400
2-V	Dome Oil & Minerals Syn. N. L.	999,040
3-V	Woodside (Lakes Ent.) Oil Co. N. L.	9,879,600
4-V	Lochiel Oil Search & Prospecting Co.	757,130
5-V	J. G. Fuller	8,824,960
WESTERN AUSTRALIA		
1-W	West Australian Petroleum Pty., Ltd.	186,848,000
2-W	Exoil Pty., Ltd.	58,641,880
3-W	Hackathorn Oils Pty., Ltd.	*25,000,000
4-W	Textralian Oil Pty., Ltd.	*19,000,000
5-W	Frome Broken Hill Pty., Ltd.	44,032,000
6-W	Gulf Oil Syndicate	7,040,000
7-W	Hawestone Oil Co., Ltd.	3,520,000
8-W	Westralian Oil, Ltd.	5,920,000
9-W	Jackson Exploration	10,112,000

*Application pending.

of this oil must be brought in by tanker from overseas. Domestic demand his risen nearly 30% in the past 4 years.

Six Australian refineries process this crude. Since 1946 the country's refining capacity has risen from 7,500 bbl. per day to 237,000 bbl. at present. Operation of these refineries saves about $80 million per year in foreign exchange. Production of domestic crude would save much more.

Australia has 10 million of the world's most literate people, highly industrialized, with a standard of living about like that of Canada. There are about 2,665,000 motor vehicles in operation, or one for each 3.8 people. This gives it fourth world rank in vehicle ownership on a per-capita basis. Australia now produces its own automobiles, buses, trucks, and tractors. Modern highways, service stations, and motel systems are now accelerating the demand for motor fuel.

Fourteen domestic airlines serve the country, and the government-owned Qantas Empire Airways, Ltd., operates worldwide. The domestic lines alone fly over one billion miles per year in passenger and freight payloads. Whether internal or foreign, Australia's distances require large air facilities.

By promoting immigration and encouraging industry with low taxes, the Commonwealth hopes to increase the population to 30 million. It hopes to trigger this growth with oil.

But the oil market is only a part of the story.

The Australian natural-gas market . . . Over 80% of Australia's people live along the southeast coast, from Adelaide to Brisbane. This is a temperate zone, with extremes of climate. Sydney has cool winters. Melbourne and Adelaide often have snow. The people heat their homes with coal or artificial gas generated from coal. One natural-gas pipeline system could serve the whole area.

Electric power is expensive in Australia. Almost 76% is provided by steam power stations. Hydroelectric plants account for 19% of the total. The vast Snowy Mountains hydroelectric scheme will not be completed until 1980. Much of Melbourne's power is generated by gasifying brown coal at Yallourn, 110 miles away.

Australia has the world's lowest-cost steel production. It has some of the world's largest deposits of iron, aluminum, copper, lead, zinc, and

WATER WELL drilled in 1907 struck gas at 3,702 ft. and caught on fire. This well in Queensland burned for 6 weeks before it was controlled. Fig. 5.

gold. In the artesian sands that underlie much of the continent, Australia has a supply of fresh water estimated to be greater than the American Great Lakes. To develop these resources, the country must have fuel, and natural gas would be an ideal answer.

It has been estimated that there is a present demand for natural gas in Australia of about one billion cubic feet per day. At the modest price of 12 cents per M.c.f., this would bring the producers $50 million per year.

Inevitably, when a country offers such favorable geology, a benevolent government, and when public and industrial interest mount to such heights, success in oil finding eventually occurs. It is the firm belief of many reputable geologists that major success will come to Australia, if not in the next 5 years, then surely at some time during the 1960's.

Acknowledgment

Some of the information in this article was supplied by Dempsey-Tegeler & Co., Houston.

Another Triassic oil pool is added to British Columbia Milligan Creek district

THE FIRST of this year's wildcats in the Milligan Creek district of northeastern British Columbia has discovered another Triassic oil pool. Success was indicated when the well, operated by Union Oil Co. of California and drilled jointly with Hudson's Bay Oil & Gas Co., Ltd., flowed oil to surface during the initial and only drill-stem test conducted on it. While rate of flow was not measured, it is understood that it was quite substantial during the 64-minute period the valve was left open after oil surfaced.

The well, Union-H.B. D-46-A Milligan, on ¼ Unit D, Unit 46, Zone A, National Topographic Series Index Map 94-H-2, lies 6 miles southeast of oil production in the same team's Milligan Creek field, 12 miles northwest of the Sinclair et al. D-39-E Doig, Triassic oil discovery well and 55 miles northeast of Fort St. John.

The drill-stem test was conducted over a 41-ft. interval in the base of the Triassic—or "D" zone—at the 3,700-ft. level. Oil surfaced in 24 minutes and the valve was left open 90 minutes. Pipe recovery consisted of 1,150 ft. of 41.7°-gravity oil and 60 ft. of black sulfurous water.

After reaching total depth on the well, the operator set casing and tubing and is preparing to perforate opposite the oil zone at the present time.

Three major pools . . . British Columbia is just in its infancy as far as oil exploration is concerned. It contains three major oil-field areas within a distance of 60 miles of one another, and with the new discovery and the Sinclair Doig strike the intervening area between the most southerly (Boundary Lake) and the Milligan Creek field proper—a distance of 50 miles—is being explored successfully.

All of B.C.'s major oil reserves to date have been found in the Triassic horizon, although the Bluesky sector of the Lower Cretaceous has also been found productive of crude iin the Beatton River field, 6 miles northwest of Milligan Creek.

Activity in developing and exploring new oil reserves in this area of the province has not as yet reached its peak due to unseasonable weather conditions. It seems strange that during the season in which many operators wanted particularly to increase activity (due to the expected construction of a pipeline from the fields) the weather failed to cooperate and the area is basking in summer-like conditions. Thus, movement of heavy equipment in some regions is still an impossibility.

Pipeline . . . Very little has been reported on the situation other than the Government of British Columbia report stating that a permit had been awarded to Peace River Pipe Line (B.C.), Ltd. It is understood from reliable sources that construction will start in the spring with the line expected to be completed next fall.

Although major interest in all of the fields from which oil will be taken when the line is completed is held by Triad Oil Co. at Beatton, Union-Hudson's Bay at Milligan and Imperial and Texaco Exploration at Boundary, a number of other firms were successful in picking up leases in the fields at the last government sale. Among those were: Amerada Petroleum Corp.; Dome Petroleum Corp., Ohio Oil Co. (its first holdings in B.C.); and a Scurry Rainbow Oil, Ltd.-headed team.

North Texas County gets first gas discovery

Central Denton County, North Texas, has completed its first gas discovery at a rank wildcat 3 miles east of Denton townsite. There is no nearby production and the Lower Pennsylvanian zone where gas was found is not productive elsewhere in North Texas.

Bayview Oil Corp. and Carter-Gifford Oil Co. 1 W. T. Evers, M. E. Forest Survey, A-417, flowed 5,400 M.c.f.d. of gas, open flow, from the Cordell sand at 3,663-76 and 3,680-86 ft. Total depth was 3,889 ft. Top of the sand was 3,659 ft. Flowing tubing pressure on 14/64-in. choke was 1,075 set well to the field discovery. The

psi., increasing to 1,730 psi. when shut in.

Additional pay was indicated up the hole in the Caddo, at 2,914-24 ft.

Bayview Oil and others control approximately 1,500 acres around the well and have begun a second well in the area.

There are two oil reserves in Denton County, the Bolivar pools in the northwestern corner and Pilot Point pool near the town of Pilot Point, which starts in Cook County and extends slightly into Denton County. Both areas produce from shallow Strawn sands.

Rio Grande has gas-condensate strike

A rich gas-condensate discovery has been made by Phillips Petroleum Co. in eastern Starr County, near the Hidalgo County line, 25 miles northwest of McAllen, in Texas' Rio Grande Valley.

Completion is in the lowest of three deep Vicksburg pays tested at depths below 8,432 ft. Perforated at 9,270-84 ft., this pay tested 5,300 M.c.f. of gas and 508 bbl. of condensate daily through small chokes.

Earlier tests of a 23-ft. sand at 8,432 ft. flowed 2,100 M.c.f. of gas and 84 bbl. of condensate per day. A deeper 12-ft. zone tested 3,700 M.c.f. of gas and 207 bbl. of condensate per day.

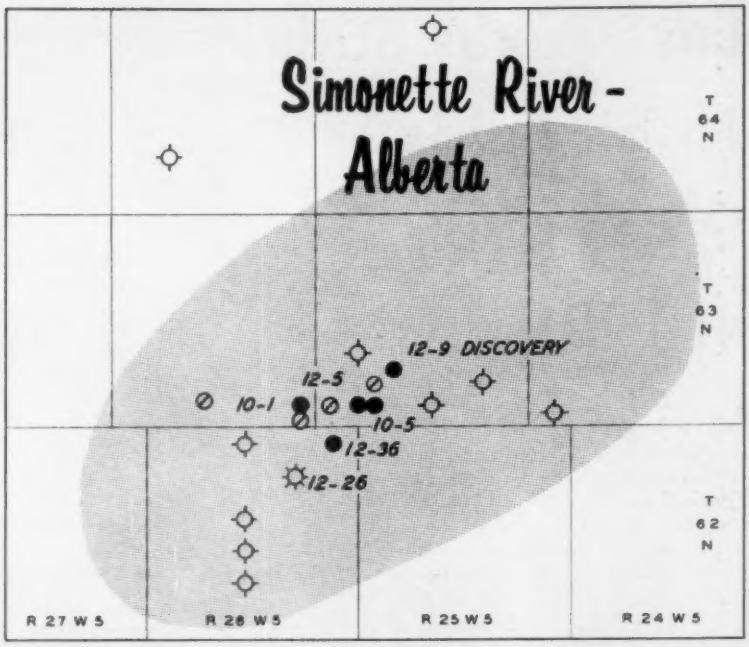
The well, 9-A Bentsen, is on the company's 11,500-acre Javalina Ranch lease block. Nearest deep production is 4 miles southeast in Javalina Frio and Vicksburg field.

South Texas wildcat completed

A wildcat drilled by Lion Oil Division of Monsanto Chemical Co. south of Yorkton, in DeWitt County, South Texas, is being completed as a good gas-condensate discovery well in two of the five potentially productive Lower Wilcox sands it logged while drilling to 10,517 ft.

Completion zones are perforated at 9,716-34 ft. and 9,840-70 ft., respectively. The lower zone produced 3 M.M.c.f. of gas and 75 bbl. of condensate per day through ⅜-in. choke. The upper zone is good for 2,200 M.c.f. of gas and 60 bbl. of condensate per day, flowing through ¼-in. choke.

The well, 1 Belitz, in the Stephen Best Survey, is on a unit block owned jointly by Monsanto and Humble Oil & Refining Co. A confirmation well is being started.



DETAILS are out on Simonette River oil field, northwestern Alberta. This was one of 1959's exploratory highlights in Canada.

Canadian field had big year

DETAILS on the "tight" Simonette River project in northwestern Alberta were released by Shell Oil Co. of Canada Ltd. Only wells inside the field limits are reported, however, leaving the rumored Devonian D1 gas discovery on the tight list.

Shell staked 5 tests in the area last summer to confirm the Devonian D3 reef oil production found in 1958. Two of those indicated oil production, two were dry, and one is apparently a gasser. The program which Shell set up just after the discovery well was reported netted two oilers and two dry holes.

The only well producing currently is the 12-36 Simonette on LSD 12, 36-62-26w5, 1½ miles southeast of the 10-1 well.

Big West Texas well extends Upton field

The Fradean (Ellenburger and Devonian) field recently opened by Neville G. Penrose 1 King Ranch, 8 miles northeast of McCamey, in Upton County, West Texas, has been extended ½ mile to the north.

The field's second well is Odessa Natural Gasoline Co. 1 J. H. Shirk Estate, which has been completed in the Ellenburger. No. 1 Shirk also had oil in other formations and its operators have requested permission to make a triple completion. If permission is granted at the hearing before the Texas Railroad Commission on February 3, it will be the first triple completion for Upton County.

Odessa Natural's well surpassed the heavy flowing potential set by the field opener, which was completed in the Ellenburger in October for 1,395 bbl. of oil through ¼-in. choke. The confirmation well and extension flowed at the daily rate of 1,718 bbl. of oil through 32/64-in. choke, from pay at 9,897-10,190 ft. Top of pay was 9,900 ft. on elevation of 3,107 ft.

No. 1 Shirk Estate is in the SW SW of Section 23, Block 2, MK&T Survey.

Reports did not specify the other two pays from which completion is planned, but 1 Shirk Estate yielded oil on two tests of the Canyon at 7,415-75 ft., the Strawn at 7,945-8,041 ft., the Devonian at 8,200-8,760 ft., and had gas and condensate in the Silurian at 8,860-8,980 ft.

Gulf Oil Corp. has a well going as a southwest offset to the field discovery. Its 3 King Ranch in Section 26 was drilling below 10,866 ft. at last report. The well has had oil and gas shows on several drill-stem tests.

East Texas adds 13 oil fields, 9 gas pools in 1959

BY CARL HOOT
District Editor

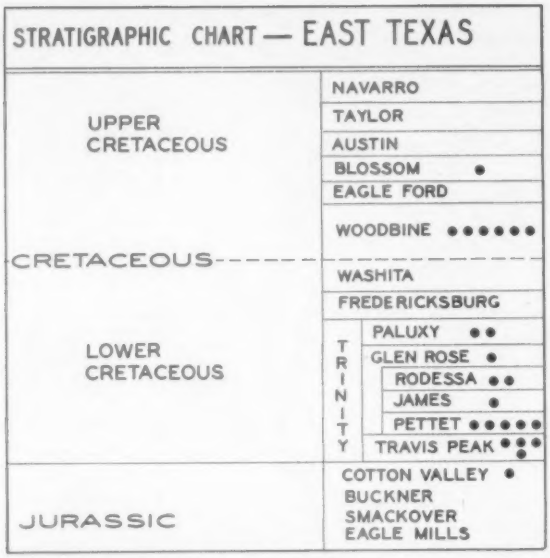
OIL FINDERS in East Texas can point to a fairly good discovery year during 1959. Texas Railroad Commission data on Districts 5 and 6 show 13 oil and 9 gas fields opened during the year. In addition, exploration in existing fields accounted for 22 new oil pay zones and 5 gas pays.

Texas' inland salt domes came in for additional exploration, resulting in new production at Bethel salt dome in Anderson County and on Butler dome in Freestone County. Texaco Inc. 10 E. C. Williams opened gas pay from the Woodbine on the northwest flank of Bethel dome when it flowed at the rate of 3 M.M.c.f.d. Freestone County's only discovery of the year was Whiffen Estate, Inc. 1 Daniel Memorial Orphanage, Woodbine oil discovery at Butler dome. The well opened Graddy field, pumping 112 bbl. of oil a day. Four dry holes were drilled in the immediate area before the discovery. The same operator is presently drilling a confirmation test.

First Cotton Valley Production

East Texas gained its first Cotton Valley oil discovery in June 1959 when Pan American Petroleum Corp. 1 Giraud was completed from three separate pay zones as opener of East Linden field. Development in the field at the end of the year had added two wells, with one drilling. One of the wells added a new oil pay in the Pettet limestone, and extended Cotton Valley production 1 mile to the east.

East Linden field is the most hopeful sign yet in the long search for Jurassic oil in Texas. Across the line in North Louisiana and South Arkansas, both Cotton Valley and Smackover are prolific producers, but permeability and porosity decrease to the west, and Texas tests have had little luck. However, pay thicknesses in 1 Giraud were 43 ft. in the lower zone, 36 ft. in the middle and 130 ft. in the upper zone. Total combined potential was over 500 bbl. of oil a day.



TYPICAL STRATIGRAPHIC chart for East Texas, showing the formations which produced the discoveries during 1959. Number of black dots following the formation, or member name, indicate the number of discoveries.

COUNTY OUTLINES are shown for those counties in East Texas which had either oil or gas discoveries in 1959. Symbols do not represent the discovery location.

Extension well at East Linden, and ready for completion at year's end, is at Pan American 1 Shelton, 1 mile east of nearest Cotton Valley production. No. 1 Shelton flowed 382 bbl. of oil a day through small choke from the Lower Cotton Valley, and pumped 58 bbl. of oil a day from the Pettet.

Fastest growing of the new fields opened in 1959 were New Diana (Woodbine) field in southeastern Upshur County, and Friendship field (Rodessa) in southern Cass County.

New Diana field was opened in August at Lyons & Logan 1 Bentley Brown, about 2½ miles southeast of Diana townsite. Completion was on the pump, for 102 bbl. of 40° oil a day from Woodbine sand at 3,740-51

ft. Continued development is expected for the area during during 1960 as only two dry holes have been drilled in the area, both on the northwest side of the field.

Friendship field in southern Cass County was opened by Sam Sklar and Sunray Mid-Continent Oil Co. 1 O. W. Lemmon, 2½ miles northwest of Lodi. The discovery made a flowing well from the Rodessa, gaging 190 bbl. of oil a day through small choke from pay at 6,162-72 ft. By year's end 12 other good oilers had been completed in the field.

Danville field, situated on the Gregg-Rusk county line, has prospects of developing into a major discovery. The discovery, F. R. Jackson and Maxwell D. Simmons 1 Lone Star Producing Co. flowed 37 M.M.c.f.d. of gas from the lower Pettet, plus 350 bbl. of condensate, and 1,230 M.c.f.d. of gas plus 40 bbl. of condensate from the Travis Peak. At the end of the year development included one producer to the south of the discovery in Rusk County, and one producer on the north side in Gregg County. Two wells were near completion stage in Gregg County, while one well was drilling in Rusk County.

Success ratio in East Texas was 10.6%. The Texas Railroad Commission listed a total of 274 wildcat completions during 1959, which opened 13 new oil fields and 9 new gas fields.

Most important find in Paradox reported

THE MOST IMPORTANT discovery in the Paradox basin since Aneth itself is now history.

Pure Oil Co. completed the Northwest Lisbon wildcat in San Juan County flowing 587 bbl. of oil daily on 14/64-in. choke from the McCracken member of Devonian through perforations at 8,261-8,348 ft.

This is the first commercial Devonian production anywhere in the southwestern Rockies, Utah, and the Paradox basin. Pure also found a thick Mississippian gas section at the well, but did not complete in that zone. The well made more than 17 M.M.c.f.d. during tests of Mississippian earlier this winter. Northwest Lisbon ranks as the most important discovery of 1959, and its successful completion marks it as the most important completion thus far in 1960. Offsets are under way and planned as Paradox operators seek to evaluate the Devonian as a potential big producer in a basin of Pennsylvanian production.

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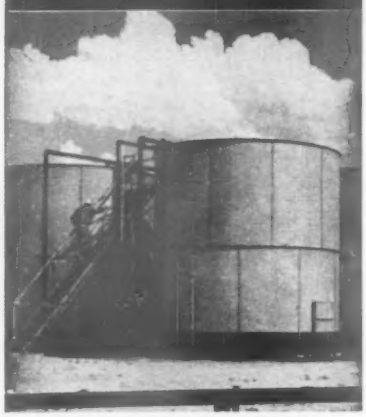

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Here's the Oklahoma drilling action:

Eighth well added to Oklahoma's North Dover

Oklahoma's North Dover field in Kingfisher County added its eighth producing well last week. The new producer is King-Stevenson Oil Co. 1 Bowerman-B in C NE NW 22-18n-7w.

Flow was 48 bbl. of oil per hour on ¾-in. choke from Manning sand at 7,012-24 ft. The field was discovered by the same firm in 27-18n-7w.

New gas field looms for Sooner's Kingfisher

Kingfisher County has a new gas discovery. It is Apache Oil Corp. 1 Snow Unit in SE NW 5-15n-7w, 3 miles southwest of the city of Kingfisher.

Flow was 4,250 M.c.f.d. on drill-stem test at 7,807-70 ft.

Oklahoma's Dewey County has new Morrow find

A new lower Morrow Pennsylvanian gas discovery looms in northwestern Oklahoma. Carter Oil Co. 1 Spangler, C SW NE 13-17n-19w, 4 miles west of West Valley Center field in Dewey County, flowed 5 M.M.c.f.d. at 11,720-65 ft.

This new prospect is west of West Valley Center field where there is production from Tonkawa, Oswego, and Cherokee, all Pennsylvanian sands.

Good Hunton well finaled in Oklahoma

Pan American Petroleum Corp. 3 House Unit is a new Eola field Hunton lime producer in Garvin County, southern Oklahoma.

The well flowed 973 bbl. of oil daily on 20/64-in. choke from perforations at 7,530-34 ft.

Offset due at new Woodward discovery

The first offset try to a new Custer Mississippian gas field in southeastern Woodward County, northwestern Oklahoma, will be drilled by Ashland Oil & Refining Co. at 1 Fox Unit, C SW NE 4-20n-17w.

The well is southwest of Ashland's 1 Shoreline discovery in C NE SW 34-21n-17w. That discovery flowed 3 M.M.c.f.d. on ¼-in. choke from perforations in the Chester at 7,952-80 ft.

Second Hunton well completed in Lincoln pool

The second producer in a new Lincoln County field in central Oklahoma is indicated at Apache Oil Corp. 1 Culie, C SW NW 12-16n-2e. The well flowed 3,500 M.c.f.d. in 10 minutes on a test of the Hunton lime at 4,689-94 ft.

The discovery well of this field was T. N. Berry 1 Wilkins in SE NE NE 11-16n-2e. That well flowed 14,134 M.c.f.d. and 26 bbl. condensate.

Graneros-Drake well finaled in San Juan

Graneros and Dakota Upper Cretaceous oil production was established in northwestern New Mexico's San Juan basin, 2 miles southwest of Ballard gas field, San Juan County. The well is Western Gas Co.'s oiler which had a combined flowing potential of 107 bbl. daily. Production is from Graneros at 6,354-66 ft. and the Dakota at 6,540-70 ft. Flow was on 20/64-in. choke.

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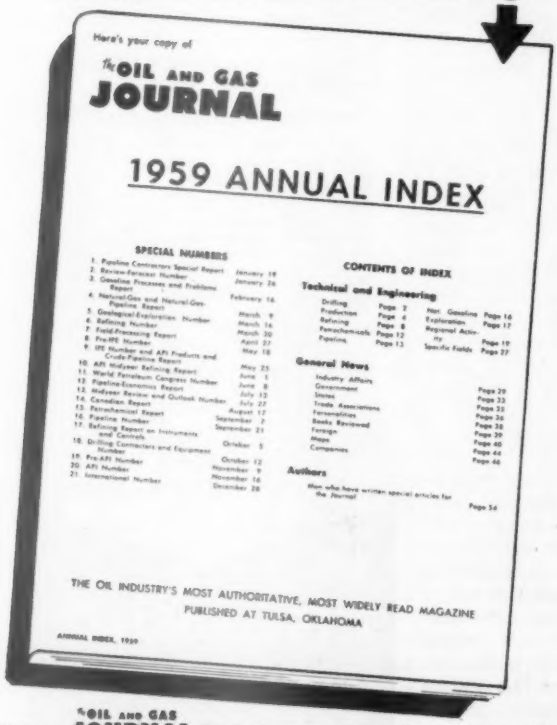

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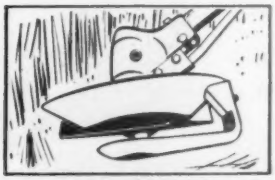

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Offset completed for new Ohio pool

In Ohio, Ohio Fuel Gas Co. announced the completion of the first offset, about ½ mile northeast of the new pool discovery in Jackson Township, Vinton County.

It's 1 Bryon Tatman, Section 7, found the Clinton sand at 2,110-20 ft. Natural gage was 175 M.c.f.d. and 607 M.c.f.d. with rock pressure of 885 psi. after fracture.

A third well being drilled by the same operator, 2 Elbert Turner, Section 7, gaged 804 M.c.f.d. natural from the sand at 2,061-69 ft. and is now being fractured.

Continental Oil Co. has scheduled another rank wildcat in southwestern Ohio in an area that has had little activity. This test is in Butler County on 1 Arthur E. Crist, Section 6, Wayne Township, about 20 miles northeast of its test in Hamilton County, which was dry.

Old Custer wildcat to deepen in Oklahoma

An old Custer County wildcat, the J. M. Huber Corp. 1 Wagner in C NE SW 10-12n-16w, will be deepened to 18,500 ft. and Hunton Siluro-Devonian lime. The new well will be drilled by G. C. Parker.

Early last year the wildcat found some gas in the Primrose and Springer. Old total depth is 15,617 ft. with Springer topped at 15,446 ft. This well is 16 miles south of North Custer City field, a Hunton lime discovery of last year.

East Kentucky wildcat is being abandoned

In eastern Kentucky, Gulf Oil's wildcat 1 Robinson about 10 miles northwest of Manchester, county seat of Clay County, has been abandoned as a dry hole. Test was taken to a total depth of 1,434 ft. Corniferous lime topped at 1,331 ft. had a show of oil from 1,372 to 1,410 ft. Gulf is planning a second test in the area.

Geologist will lecture

Dr. Erling Dorf, professor of geology at Princeton University will lecture on "The Earth's Changing Climate" as the fourth of eight distinguished earth scientists sponsored by the Distinguished Lecture Committee of the AAPG during the 1959-1960 season. Professor Dorf will present his lecture to 32 geological societies and university groups in the United States and Canada between January 4 and February 9, 1960.

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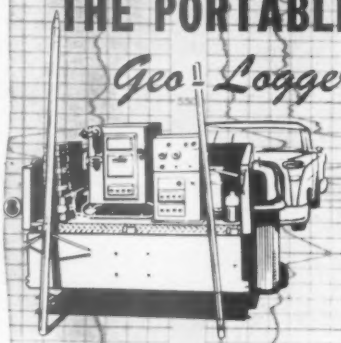

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Drillers made news in California . . .

Discovery well beat by offset completion

IN AN INTERESTING twist on the usual practice, Tidewater Oil Co. completed the first offset to a discovery well before the discovery was completed. This unique situation took place in the recently discovered Lakeside field northeast of Paloma in California's Kern County.

Late last November, Tidewater 86-3 KCL logged 99 ft. of upper Stevens sand which subsequently drill-stem-tested at a rate of 700 bbl. daily. Shortly thereafter, Tidewater spudded in an extension test 900 ft. northwest of the discovery well.

The discovery was originally planned as a deep test so Tidewater continued drilling ahead, putting the discovery zone behind pipe, while the offset was drilled into and completed in the zone at 8,873-8,941 ft. The discovery was drilling ahead below 11,400 ft. when the offset was brought in. Initial production in the offset was 232 bbl. daily of 34°-gravity crude through a ⅜-in. choke.

Tidewater announced plans to use two rigs in developing the field where the company has 3,000 acres under lease. The next test will be 1,320 ft. west of the offset.

Success seen at High School test

Early indications point to a successful wildcat in a 7,468-ft. well drilled by Allen Guiberson on the Beverly Hills High School in Los Angeles County. The wildcat reportedly starting flowing at an undisclosed rate with pressures building up. Drill site for this well is immediately east of Universal Consolidated Oil Co.'s prolific production on the 20th Century Fox movie property in West Los Angeles. No perforation details or production rates were available on the tight hole.

New pool found at Mountain View

A possible new pool discovery 1 mile south of Kern County's Mountain View field was being credited to a wildcat drilled by Verde Enterprises as operator for Ancora Corp. The 9,264-ft. test flowed gas to the surface in 1½ hours and recovered an 830 ft. net rise of light oil on a 2½-hour formation test of the interval 9,160-9,210 ft. On a second formation test, gas surfaced in 35 minutes and the test recovered 4,220 ft. net rise of clean oil with a 1,500-ft. mud cushion.

Rancho San Bernabe offset looks good

The first offset to the recently discovered Rancho San Bernabe field in Monterey County pumped and flowed 414 bbl. in a 22-hour period just after being put on the pump. The 16°-gravity crude was coming from perforations at 2,139-2,034 ft. The well is a southwest offset to the discovery. This activity is 18 miles north of the big San Ardo field.

New pool for California's Pyramid Hills

Drilling and Production Co. reportedly discovered a new pool in King County's McClure Valley with a wildcat 1 mile west of the productive Dagany area of Pyramid Hills field. Initial production in the 4,960-ft. wildcat was 85 bbl. daily of 47°-gravity crude flowing through an 8/64-in. choke.

Wasatch gasser finaled at Utah's Chapita wells

A Wasatch Tertiary gas well was completed 2 miles east of similar production in Chapita Wells Unit, Uintah County, Uinta basin, Utah. Belco Petroleum Co. 6 Unit, SE NW 24-9s-22e, was completed on calculated absolute open flow of 3,900 M.c.f.d. from perforations at 5,430-5-614 ft. The other gas well on the unit is Belco 5 Unit, 2 miles west, also a Wasatch producer.

. . . and Wyoming

Wyoming's State Line unit has its fifth producer

The fifth well at State Line Unit field in Sweetwater County, Green River Basin, flowed 15 bbl. of oil per hour on drill-stem test at 3,916-42 ft. in Fort Union Tertiary.

The well is Gulf Oil Corp. 5 State Line Unit in SW NW 18-12n-94w. This is the best recovery yet in the unit. The 2 State Line Unit in SW SE 18-12n-94w got 2,529 ft. of clean oil during test previously, but Gulf finally completed the well in the Wasatch for 9,200 M.c.f.d.

Fort Union gas production was opened at 3 State Line Unit, the off-

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4 State Line, ½ mile east of the discovery well, was dry. The first well on the unit, 4 miles northeast of the discovery well, had gas shows 2 years ago, but was abandoned. This promising new field is near the Colorado state line, 12 miles west of South Baggs gas field.

Powder River may have first '60 Minnelusa pay

Powder River basin may have its first Minnelusa discovery of the new year at True Oil Co. et al. 1 Wolff-D, C SE NE 35-49n-71w, Campbell County, northeastern Wyoming.

Recovery on a drill-stem test at 9,850-86 ft. was 3,000 ft. water cushion, 500 ft. oil, including heavily cut muddy water, 3,020 ft. gassy black oil, and 640 ft. of oil-cut water.

Location of this prospective Pennsylvanian strike is 4½ miles southwest of Timber Creek field, a Minnelusa producer.

Remote wildcat set for Wind River basin

Shell Oil Co. will drill to 12,000 ft. to Lance Upper Cretaceous in a well-barren township in north-central Wind River basin, Fremont County, Wyoming.

The 23-15 Howard Ranch unit, NE SW 15-39n-93w, is 5 miles from any drilling. Nearest shallow drilling is 5 miles south at Picard Ranch, and nearest deep drilling is at Lost Cabin field 16 miles southeast.

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Discovery wells

CALIFORNIA

Kings County: Drilling and Production Co. 44-32 Orchard, SW NE 32-24s-18e, 85 BOPD, 47° gravity, 0.1% cut, 8/64-in. choke, perfs. 3,617-4,002 ft., TD 4,960 ft. (New field discovery 1 mile west of Pyramid Hills oil field.)

WESTERN CANADA

Alberta: Kewanee 4-7 Inverness, LSD 4, 7-69-10w5. Indicated oil discovery, Beaverhill Lake zone. TD 7,966 ft.

British American-Pan American 2-1 Cora Swan, LSD 2, 1-66-11w5. Indicated Beaverhill Lake oil discovery. TD 8,864 ft.

Mic Mac et al. 16-11 North Pembina, LSD 16, 11-50-8w5. Cardium oil discovery. TD 4,734 ft.

Pan American 6-16 Lobstick, LSD 6, 16-50-6w5. Cardium oil discovery. TD 5,760 ft.

Shell 10-22 Kaybob, LSD 10, 22-63-19. Indicated Beaverhill Lake oil discovery. TD 10,140 ft.

Imperial 10-11 Judy Creek, LSD 10, 11-63-11w5. Beaverhill Lake oil discovery. TD 8,791 ft.

Cree-Cego 6-2 Carstairs, LSD 6, 2-30-3w5. Cardium oil discovery. TD 8,632 ft.

Shell 12-26 Simonette, LSD 12, 26-62-26w5. D1 gas discovery. TD 11,965 ft.

Cal-Standard 4-20 North Gilby, LSD 4, 20-41-2w5. Pekisko gas discovery. TD 8,243 ft.

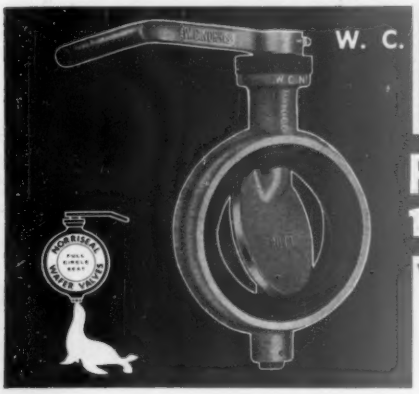
Pan American 1-20 Birch Lake B-1, LSD 1, 20-51-12w4. Blairmore gas discovery. TD 2,595 ft.

Pan American et al. E-1 14-26 Lobstick, LSD 14, 26-50-8w5. Gas discovery. TD 6,394 ft.

British Columbia: Texaco-NFA D43-H Cameron River, 43-H-94-B-10. Triassic gas discovery. TD 9,472 ft.

ILLINOIS

Clay County: National Associated Petroleum Co. 1 B. Misenheimer, SW SE NE 26-3-n-7e. IP 37 BOPD, 70 BWPD, Be-



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noist 2,883-2,902 ft.; O'Hara 3,013-18 ft. TD 3,130 ft. New field.

Williamson County: Mutual Oil & Gas Corp. 1 Madison "E", NW NE SW 15-8s-3e. IP 105 BOPD, Cypress 2,284-2,316 ft. TD 2,317 ft. Opens East Johnson City field.

INDIANA

Dubois County: Highland 1 Seng-Lange Comm., SE NE SE 2-2s-6w. IP 20 BOPD, 40 BWPD, Aux Vases 935-941 ft. TD 950 ft. Opens North Duff field.

Spencer County: Hart & Hart 1 John & Alma Long, NW NE NW 36-5s-6w. IP 20 BOPD, Aux Vases 1,171-77 ft. TD 1,177 ft. Opens North Chrisney field.

SOUTH LOUISIANA

Calcasieu Parish: Frankfort Oil Co. 1 Goldsmith Farms, 10-8s-9w. IP 345 BOPD, 3,140 M.c.f.d., 16/64-in., 52°, TP 4,400 psi., perf. 8,476-84 ft., Hackberry. TD 8,725 ft. New-field discovery.

St. Landry Parish: Whitehall Oil Co. 1 Junius J. Bertrand Unit 1, 36-5s-4e. IP 2,100 M.c.f.d., 110 BOPD, 10/64-in., 55°, TP 3,100 psi., perf. 10,295-10,315 ft., and 740 M.c.f.d., 10 BOPD, 10.64-in., 58.8°, TP 3,400 psi., perf. 10,113-123 ft. TD 10,518 ft. New reservoir discoveries off west flank of Washington field.

Sun Oil Co. 1 Burleigh Unit, 49-8s-4e. IP 1,500 M.c.f.d., condensate ungaged, 10/64-in., TP 4,100 psi., perf. 10,730-44 ft. TD 10,803 ft. New pay in Shuteston field.

KANSAS

Barber County: W. J. Coppinger 1 Lake, SE SE NE 26-31s-14w. IP 77 BOPD, 30°, Arbuckle 4,764-69 ft. TD 4,800 ft. Lake field discovery.

Chautauqua County: CRA 2 Bever "A", NW NW NE 10-33s-9e. IP 84 BWPD, 23 BOPD, Miss. 2,309-12 ft., Arbuckle 2,416-2,625 ft. TD 2,625 ft. New pool.

Finney County: Imperial Oil Co. of Kansas 1 Wampler, C SE SE 17-21s-33w. IPF 855 BOPD, 31.4°, Marmaton 4,278-4,290 ft. TD 4,695 ft. New field. Wampler.

Haskell County: United Producing Co. etal. 2 Frank McCoy Unit, C SE SE 32-28s-34w. IPF 765 BOPD, Marmaton 4,686-4,710 ft.; Miss. 5,417-34 ft., 5,437-43 ft. TD 5,635 ft. New pay at Eubank field.

Kearny County: Northern Natural Gas Co. 1-29 Toombs, C NE SW 29-26s-36w. IP 5,400 M.c.f.d., Council Grove 2,820-28 ft., 2,858-63 ft., 2,880-83 ft. TD 5,540 ft. New field.

Meade County: Shamrock Oil & Gas Corp. 1 Fletcher, C NE NE 7-33s-28w. IP 1,205 M.c.f.d., Marmaton 5,082-86 ft. TD 5,762 ft. New pay at North Borchers field.

Pawnee County: Apache Oil Co. 1 Schartz, NW NW SE 31-23s-16w. IP 2 BOPD, 40°, Miss. 4,210-20 ft. TD 4,312 ft. Opens Southeast Carpenter field.

Rooks County: Davis Bros. 1 Ordway "F", C SE NW 21-10s-18w. IP 60 BOPD, 40 BWPD, Torrington 3,331-36 ft., Lansing-Kansas City 3,368-75, 3,515-35 ft. TD 3,750 ft. East Ordway field discovery.

Russell County: A. F. Schmidt 1 McKune "B", SE NW SE 32-12s-15w. IP 104 BOPD, 42.6°, Lansing-Kansas City 3,077-83 ft. TD 3,350 ft. Opens South Reich field.

Saline County: Alfred Koehn 1 Swedlund, SE SE SW 15-16s-3w. IP 144 BOPD, Maquoketa 3,320-25 ft. TD 3,325 ft. Opens Olsen field.

Stafford County: Sierra Petroleum Co. and Houston Petroleum Co. 1 Barstow, SW SE SE 2-25s-15w. IP 100 BOPD, Arbuckle 4,425-29 ft. TD 4,429 ft. Extension and New pay at Grunder field.

Sumner County: Shawver-Armour, Inc. 1 Leis, SW SW SE 5-31s-3w. IP 683 BOPD, 42°, Simpson 4,370-76 ft. TD 4,376 ft. Opens Conway Springs field.

KENTUCKY

Breckenridge County: Earnie Bates 1 L. T. Keenan, 15-P-36. IP 2 BOPD, Jackson 193-198 ft. TD 199¼ ft. Opens Hardin School field.

Webster County: C. Sherman 1 Price, 18-M-20. IP 3 BOPD, 5 BWPD, Penn. 541-549 ft. TD 550 ft. Opens Williams pool.

MISSISSIPPI

Hancock County: Marshall R. Young Drilling Co. 1 Jordanacres, SE SE SW 35-7s-15w. IP 105 BOPD, 14.5 BWPD, 6/64-in., 36.2°, TP 600 psi., perf. 10,286½-87½ ft., Cuevas sand (Washita-Fredericksburg). TD 10,349 ft. Elev. 32 ft., Lower Cretaceous 9,703 ft. New-field discovery.

Marion County: J. Collier Hurley et al. 1 Elma Pittman, NW NW NW 30-2n-14e. IP 1,375 M.c.f.d., 36 BCPD, 10/64-in., 38.8°, GOR 38,219 cu. ft. per barrel, TP 3,500 psi., perf. 9,179-85 ft., Lower Cretaceous 9,446 ft. West extension Hub field.

Pike County: L. D. Elam et al. 1 Cook, Sr.-Sells et al., NE SW NE 8-3n-7e. IP 284 BOPD, 10/64-in., 40°, TP 1,940 psi., perf. 10,934-50 ft., lower Tuscaloosa. TD 10,980 ft. Elev. 414 ft., lower Tuscaloosa 10,855 ft. Extends McComb field.

George M. Harrison et al. 1 Board of Supervisors, NE NE NE 16-3n-7e. IP 390 BOPD, 12/64-in., 40.5°, TP 1,200 psi., perf. 10,960-75 ft. lower Tuscaloosa. TD 11,104 ft. Elev. 454 ft., lower Tuscaloosa 10,881 ft. Extends McComb field.

Simpson County: Hargrave Oil Corp. 1 Lutie D. Peacock, NE NE NE NE 24-1n-3e. IP 3,700 M.c.f.d., 64 BCPD, 14 BWPD, ¼-in., 50.5°, shut-in TP 4,500 psi., perf. 12,710-19 ft., and 12,739-52 ft., Rodessa. TD 14,209 ft. Elev. 285 ft., Lower Cretaceous 9,304 ft., Rodessa 12,550 ft., Sligo 13,100 ft., Hosston 13,600 ft. Extends Merit field.

Walthall County: Union Producing Co. 1 Prisk, SE NE NE 11-1n-12e. IP 154 BOPD, 10 BWPD, ⅛-in., 36°, TP 1,359 psi., GOR 885 cu. ft. per barrel, open hole 9,649-78 ft., lower Tuscaloosa. TD 9,678 ft. Elev. 341 ft., lower Tuscaloosa 9,455 ft. Extends Dexter field.

NEW MEXICO

Chaves County: R. L. Lusk, Jr. 1 Gulf-State, 17-10s-27e, 13 miles southeast of Roswell. IPP 5 BOPD, 35°, Penrose 1,142-78 ft. TD 1,190 ft.

Lea County: Sinclair Oil & Gas Co. 1-886 State-Lea, 16-20s-33e, 2 miles east of Salt Lake field. IP swabbed 586 BOPD, 29°, GOR 100:1, Seven Rivers 3,220-32 ft. TD 3,325 ft.

OKLAHOMA

Beaver County: Texaco Inc. 1 Dick Naylor, C SE NW 11-1n-22eCM. IPF 1,024 M.c.f.d., Morrow 7,384-89, 7,397-7,403 ft. TD 8,352 ft. New field.

Cities Service Oil Co. 1 Woodbury "C", NE SW NE 7-2n-25eCM. IPF 4,800 M.c.f.d., Chester 7,803-05, 7,828-36, 7,852-71, 7,882-86 ft. TD 8,055 ft. New pay in Mocane field.

Sinclair Oil & Gas Co. 1 W. E. Overton, C NE SW 13-3n-23eCM. IPF 390 BOPD, 44°, Oswego 6,318-55 ft. TD 7,595 ft. New field.

Blaine County: Sunray Mid-Continent 1 A. O. Baker, C SE SE 36-14n-13w. IPF 3,100 M.c.f.d., Cherokee 10,776-806 ft. TD 10,806 ft. New field.

Ellis County: Pan American Petroleum Corp. 1 Sherrill Operating Unit, C NW SE 36-21n-25w. IPF 1,790 M.c.f.d., Morrow 9,853-66 ft. TD 10,386 ft. New field.

Garvin County: Nelson & Spain 1 Isaac, SW NE 22-3n-1w. IP 84 BOPD, 32°, Second Bromide sand 4,636-38 ft. TD 4,811 ft. New field.

Grant County: SaCuna-Jefferson 1 Schultz, NE NE SE 36-25n-4w. IP 360 BOPD, 44.7°, Skinner 5,042-47 ft. TD 5,103 ft. New field.

Kingfisher County: Calvert Drilling Inc., and King-Stevenson 1 Corr, SE NW 13-17n-7w. IP 300 BOPD, 41.5°, Oswego 6,649-61 ft. TD 7,850 ft. New field.

Major County: Livingston Oil Corp. and Oklahoma Natural Gas Co. 1 Keokn, SW SW NE 19-22n-10w. IP 120 BOPD, Manning 6,750-60, 6,764-74, 6,778-84, 6,794-6,804 ft. TD 6,870 ft. New field.

Pittsburgh County: Bell Oil & Gas Co. 1 Grace Fargo, SE SE SW 7-5n-12e. IPF 3M.M.c.f.d., Boggy sand 1,275-87, 1,144-58 ft. TD 3,198 ft. New field.

Seminole County: Carter Oil Co. 1-A Rosanna Arhalokoche, NE NW SW 28-10n-8e. IPF 13,500 M.c.f.d., middle Wewoka sand 1,094-1,131 ft. TD 1,176 ft. New field.

Texas County: Republic Natural Gas Co. 1 D. C. Curtis, C NW SE 16-6n-16eCM. IP 57 BOPD, 100 BWPD, 46.5°, St. Louis 6,854-58 ft. TD 6,940 ft. New field at Burdge.

WEST TEXAS

Andrews County: Ralph Lowe 1 Magnolia-Morgan, Sec. 14, Blk. A-50, PSL Sur., 32 miles west of Andrews, southwest offset to Wichita Albany discovery. IP 498 BOPD, 18/64-in. choke, 43°, GOR 700:1, TP 475 psi., Ellenburger 11,212-58 ft. TD 11,305 ft., elevation 3,323 ft.

Dawson County: Amerada Petroleum Corp. 1 R. C. Moore, Sec. 14, Blk. 36, T5N, T&P Sur., 2½ miles southwest of Lamesa. IP 286 BOPD, 24/64-in. choke, 38°, GOR 439:1, TP 390 psi., Lower Mississippian 11,280-11,322 ft. TD 12,089 ft., elevation 2,949 ft.

(More fields on page 163)

LEGAL

SALE OF OIL AND GAS MINING LEASES TRIBAL AND ALLOTTED INDIAN LANDS, Department of the Interior Bureau of Indian Affairs, Uintah and Ouray Agency, Fort Duchesne, Utah. SEALED BIDS will be received until 2:00 P.M. Mountain Standard Time, February 9, 1960, and opened at that time in the Office of the Uintah and Ouray Indian Agency, Fort Duchesne, Utah, for the leasing of 640 acres of Tribal Indian lands, and 967.94 acres of allotted Indian lands, located in Townships 10 and 11 South, Range 20 East, Salt Lake Meridian, Uintah County, Utah, for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of the Uintah and Ouray Indian Agency, at Fort Duchesne, Utah.

Gas Exports Vital to Canada

. . . says B-A's new president and chief executive officer. He's a veteran oil man and an expert on natural gas.

EDWARD D. LOUGHNEY, a burly ex-footballer, now quarterbacks operations of British American Oil Co., Ltd.

Loughney is the new president of B-A, Toronto-based company with assets estimated at more than $500,000,000, including two U. S. subsidiaries, British-American Oil Producing Co. and Toronto Pipe Line Co. The company markets in all 10 provinces of Canada, plus the Yukon Territory, and has six refineries.

An oil man with 32 years' experience, Loughney has devoted the last 8 years to the development of the industry in Western Canada. He has become one of Canada's leading authorities on natural gas.

Canada's National Energy Board recently held initial hearings on gas-export proposals, and Loughney says, "Increased markets for gas will help balance the Canadian petroleum industry by giving it a wider base.

"Sales revenues will begin to return to us the millions of dollars we have tied up in the development of gas reserves, for which we have been receiving very little income."

Edward D. Loughney
. . . calls the plays for B-A.

Background . . . Loughney, 54 was born in Sisterville, W. Va.

He moved with his family to Oklahoma and obtained a bachelor of science degree in law and finance from the University of Oklahoma. But it wasn't too surprising that Loughney went into the oil business. His father and grandfather were oil men.

Loughney joined Gulf Oil Corp. at Seminole, Okla. After 18 years in the company's Tulsa production division, he was appointed executive assistant to the divisional vice president in 1950.

The following year he moved to Canada as manager of the expanded operations of Canadian Gulf Oil Co., based at Calgary.

In 1956, when B-A absorbed Canadian Gulf, Loughney became a vice president and director of B-A. During the last 3½ years he has had broad responsibilities involving all phases of the business.

He has played major roles in such developments as the Pincher Creek and Nevis gas-producing plants and discoveries such as the Steelman field in Saskatchewan, Fenn - Big Valley, Dick Lake, and Swan Hills in Alberta.

Although he's on the job 6 days a week, Loughney still squeezes in other activities. His directorships include Trans-Mountain Pipe Line Co., Trans-Northern Pipe Line Co., Interprovincial Pipe Line Co., Westspur-Producers Pipe Line Co., Montreal Pipe Line Co., Ltd., Portland Pipe Line Corp., and Peace River Pipe Line Co.

He's a member of the American Petroleum Institute and in 1956 became one of the first honorary life members named by the Canadian Petroleum Association.

●

Vernon C. Vance, assistant maintenance superintendent at Mobil Oil Co.'s Ferndale, Wash., refinery, has been transferred to the new El Palito refinery of Mobil Oil Co. de Venezuela in Puerto Cabello, Venezuela. Vance will be mechanical general foreman at the new refinery.

Bill Stanley, Union Oil Co., has been elected president of the New Mexico Landmen's Association. Other officers for the 1960 term are **Max Wilson,** Gulf Oil Corp., first vice president; George Sewell, Cities Service Oil Co., second vice president; **Fred Millsap,** Atlantic Refining Co., secretary; **Jim Shaw,** Humble Oil & Refining Co., treasurer; and **Jo Lodle,** Sinclair Oil & Gas Co., and **Fred Tyner,** Pure Oil Co., directors.

▶▶▶ Personals

Dr. James J. Pappas has joined Esso Research & Engineering Co. in Linden, N. J.

F. J. Calhoun, station foreman for Mid-Valley Pipeline Co. in Haynesville, La., has been transferred to Mayersville, Miss., as terminal station foreman.

D. M. Shawver, independent producer and driller, has moved his headquarters to Augusta, Kans., from Wichita.

P. E. Kuhl, formerly on loan to the Iranian consortium as manager of the Abadan refinery, has returned to Esso Standard division of Humble as assistant general manager of manufacturing. Kuhl has been with Jersey Standard and its subsidiaries since 1926. He had been in Iran since 1955.

L. C. Stevens, formerly vice president, manager of production, and a director of Mobil Oil Canada, Ltd., Calgary, has been named vice president, exploration and production, for Mobil Oil Co.'s Los Angeles division. **Hugh S. Kelly,** manager of product engineering in Socony Mobil Oil Co.'s marketing department, has been appointed manager of Mobil Oil's product planning department.

W. H. Hohag, Jr., formerly president, general manager, and a director of Banff Oil, Ltd., has resigned to become director of operations for Soc. Investigadora Petrolifera, S. A., Barcelona, Spain. Banff recently purchased an equity interest in the independent Spanish exploration company, which will begin drilling on permits in Spain this spring. **J. C. Rudolph,** exploration manager for Banff Oil, has been named general manager of that company.

S. A. Click has been named manager of Marathon Pipe Line Co.'s new southwestern region, Houston. The Houston office will handle pipeline operations in New Mexico, Texas, Louisiana, and Mississippi for the Ohio Oil Co. subsidiary. Other Marathon operating divisions have been renamed. The former Martinsville, Ill., division is now the Great Lakes region with **K. E. Tappy** as manager. **E. S. Mardis** is manager of the tri-state region, formerly the Bridgeport, Ill., division. The former Wyoming division, Casper, is now the Rocky Mountain region with **M. L. Stanfield** as manager and **M. E. Parker** as assistant manager.

▶▶▶ Personals

William Harvey Skipwith, Jr., has been elected a director of Bradco Oil & Gas Co., and Bradco Associates, Inc., Houston oil development companies. He also will be vice president and secretary of both companies.

J. H. Adams, area engineer in the Shreveport, La., office of Humble Oil & Refining Co.'s Carter division, has been transferred to Billings, Mont., as northern area engineer. He succeeds **L. M. Lyon,** now with the producing coordination department of Standard Oil Co. (N. J.). **R. M. Pitcher,** assistant area engineer in Shreveport, will succeed Adams there.

Arthur L. Lanckton, vice president in charge of northern and southeastern Europe for Mobil International Oil Co., has been appointed an executive vice president for Mobil International. He will be in charge of staff services. In other appointments, **Rawleigh Warner, Jr.,** has been named acting executive vice president for Africa, Europe, and Latin America. **John C. Dean** has been named vice president, supply and distribution, with **Burton C. Fowler** as vice president for marketing, and **Charles P. Baker** as vice president, manufacturing. **Curtis M. Klaerner** has been appointed regional vice president for northern and southeastern Europe. **William E. Lindenmuth** will be acting regional vice president, Middle East. **Hugh M. Keeley,** operating advisor for Africa in New York, has been appointed regional assistant for West Africa operations.

LANCKTON

Byron K. Smith, formerly assistant general manager in Los Angeles operational headquarters of Southern Pacific Pipe Lines, Inc., has been named assistant to the president, a new position. He will headquarter in San Francisco. **William T. Eskew, Jr.,** formerly chief engineer, succeeds Smith in Los Angeles. In other appointments, **Robert R. McDaniel,** northern district field superintendent in Roseville, Calif., has been named chief engineer, Los Angeles. **Charles B. Miller,** assistant to the general manager, Los Angeles, will succeed McDaniel. **Maurice A. Huso,** electrical engineer, will succeed Miller. **John M. Goss,** engineer, succeeds Huso in Los Angeles. **Murray A. Levy,** superintendent of products movement, has been promoted, without change in duties, to manager of products movement, Los Angeles.

Jerry W. Long has been named district engineer in the new Durango, Colo., office of United States Geological Survey.

Dr. Hugh H. Horowitz and **William C. Howell, Jr.,** have been appointed research associates in Esso Research & Engineering Co.'s products research division, Linden, N. J. **Erwin H. Manny** has been named engineering associate, products research division.

J. A. Boege has been named manager of technical services at Mobil Oil Co.'s Torrance, Calif., refinery. He will be responsible for engineering, economics and planning, and the control laboratory. **J. W. Jensen** has been named chief project engineer at the Torrance refinery. He will be responsible for design, mechanical, and project engineering. Boege and Jensen are General Petroleum Corp. veterans. Merger of General Petroleum and Mobil Oil was completed January 1.

Roy Campbell, of Liebrock, Landreth, Campbell & Callaway, Midland, Tex., has been elected chairman of the Permian Basin section of AIME's Society of Petroleum Engineers. He succeeds **Harry Horton,** Dowell division of Dow Chemical Co. Other new officers are **Bill Davis,** Humble Oil & Refining Co., first vice chairman and program director; **Medford McCoy,** Continental Oil Co., second vice chairman for Odessa, Tex., membership; **Les Plumb,** Tennessee Gas Transmission Co., second vice chairman for Midland membership; and **Wilbur Yeager,** First National Bank of Midland, secretary-treasurer.

Charles W. Hancock, consultant and formerly assistant manager of Pure Oil Co.'s southwestern producing division in Tulsa, has been named manager of Pure's new northern production division in Denver. The new division combines the former Denver, Tulsa, and Olney, Ill., divisions. **James L. Morris,** manager of the Texas division, Fort Worth, will be manager of a new southern division in Houston, which combines the former Fort Worth and Houston division offices. **Chase Sutton,** Houston division manager, will serve as senior manager in the new division. **W. M. Peck,** Tulsa division manager since 1947, and **W. M. Saxon,** Olney division manager, will take early retirement. The Tulsa office will close in July and the Fort Worth office in September. Hancock joined Pure in 1949 but left the company last year to become a consultant. Morris has been with Pure since 1938 and has been manager of the Fort Worth production division since 1953.

Dr. Virgil J. Berry, Jr., formerly research group supervisor for Pan American Petroleum Corp., has joined Sinclair Research Laboratories, Inc., in Tulsa as director of the petroleum engineering research division. **Dr. Stephen E. Szasz,** technical director of petroleum engineering research for Sinclair, has been promoted to departmental research associate. Berry had been with Pan Am since 1951. Szasz joined Sinclair in Tulsa in 1952. He has directed work on new recovery methods, including thermal-recovery techniques. Berry is a member of the University of Tulsa faculty and Szasz is lecturer on the graduate faculty.

BERRY

SZASZ

L. E. Savory, project supervisor at United Gas Corp.'s Shreveport, La., laboratory, has been named assistant director of research for United Gas. Savory has been with the company in Shreveport since 1953.

Tom F. Newman, Pan American Petroleum Corp., has been elected president of the Fort Worth Geological Society. He succeeds **George Marshall,** Continental Oil Co. Other new officers are **Floyd Acklin,** Richardson & Bass, first vice president; **William E. White,** Welex, Inc., second vice president; **LeRoy J. Conn,** LaGorce Oil Co., secretary; and **Wright D. McEachin,** Sinclair Oil & Gas Co., treasurer.

Charles J. Wood, of Charles J. Wood & Associates, Inc., is the new president of the Henry H. Cross Co. and Henry H. Cross Co. of Arkansas. The Cross companies were recently purchased by Wood & Associates, Harry P. Dunn Co., and National Wax Co. Wood succeeds **George F. Fox,** who will continue as a consultant to the Cross companies. Cross company executives who will continue in their present posts include **J. N. Waddell,** general sales manager; **O. B. Bingham,** general manager of the Smackover, Ark., refinery; and **N. R. Price,** refinery superintendent in Smackover. **W. R. Tews** will be treasurer of the companies.

Personals

SCHULTZ

Paul R. Schultz, president of Blackwell Oil & Gas Co., Tulsa, was reelected president of Oklahoma Independent Petroleum Association at the group's annual meeting last week in Tulsa. Other officers were also reelected. They are **E. A. Smith,** Service Drilling Co., Tulsa, vice president; and **John J. Robertson,** Voss Petroleum Co., Shawnee, secretary-treasurer.

Dean B. Barnes, petroleum engineer with Forest Oil Corp., in Casey, Ill., has joined Continental Oil Co. in Billings, Mont., as production engineer.

J. G. Keener, station foreman for Mid-Valley Pipeline Co., has been transferred to Hornsby, Tenn., from Mayersville, Miss.

Larry Olson, Sohio Petroleum Co., has been elected president of Wyoming Oil Scouts Association. **Fred Ryan,** Superior Oil Co., will be vice president, and **Paul Ellington,** Skelly Oil Co., is secretary-treasurer.

Don Balcome, chemist at the Whiting, Ind., research laboratories of Standard Oil Co. (Ind.), has retired after 35 years with the company.

Joe Mefford, assistant division production superintendent in Tulsa for Sinclair Oil & Gas Co., has been promoted to division production superintendent in Midland, Tex. He succeeds **O. G. Simpson,** who was recently appointed assistant Midland division manager. Mefford has been with Sinclair since 1940.

C. V. Edwards, Jr., has been named division natural gas manager in Mobil Oil Co.'s Midland, Tex., office. **Jack Vickrey** has been appointed senior attorney in Midland. In Mobil's Lubbock, Tex., district, **M. W. Norris** has been named drilling supervisor. **J. R. Hissom** and **M. M. Keeble** will be production supervisors. **J. M. Moore** will be safety supervisor, and **John M. Russell,** district office manager. In the Hobbs, N. M., office, **Lee Robinson** has been named production supervisor. **L. W. Randerson** will be drilling supervisor. **L. M. Hill** has been appointed district office manager, with **A. G. Slator** as safety supervisor.

W. A. (Johnny) Watson has been named district superintendent for Humble Oil & Refining Co.'s new northwest Texas production office in Pampa.

I. J. Spilners has joined the research staff of Gulf Research & Development Co.'s product division.

Don L. Wallace and **W. Jack Ford,** formerly with Magnolia Petroleum Co., have formed Ford & Wallace Geological Associates, Lake Charles, La., consulting firm.

New members of the technical staff of Esso Research Laboratories, Baton Rouge, La., are **H. W. Helmke, R. L. Howard, F. A. Iddings, G. B. Jolley, A. D. Reichle,** and **R. G. Rosselot.**

Millard M. McElvain, superintendent of Panhandle Eastern Pipe Line Co.'s Glenarm, Ill., compressor station, has retired. McElvain joined Panhandle in 1936 as an engineer.

Bryson Filbert, formerly manager of manufacturing in Bogota, Columbia, for International Petroleum (Colombia), Ltd., has been appointed chemical products advisor to the refining coordination department of Standard Oil Co. (N. J.). Filbert has been with the Jersey companies since 1936

Carl H. Samans, director of the engineering materials division, research and development department, for Standard Oil Co. (Ind.), has been elected chairman of the Chicago section of American Institute of Mining, Metallurgical, and Petroleum Engineers. Samans has been with Indiana Standard since 1949.

Charles B. MacGlashan, sales assistant to the vice president, West Coast marketing divisions, for Shell Oil Co., has retired after 38 years with the company.

G. W. Powell, director and general manager, marine, for Esso Petroleum, Ltd., London, has been named a managing director of the company.

Lee C. Sharrai, formerly district gas supervisor in Kilgore, Tex., for Tidewater Oil Co., has been transferred to Scroggins, Tex., as project engineer.

George H. Beck, formerly senior staff engineer with Continental Pipe Line Co. in Ponca City, Okla., has joined Williams Brothers in Tulsa as senior engineer.

Johnson Bennett, formerly with Esso Standard (Libya) Inc., has joined S. H. Glassmire & Associates, Santa Fe consulting geological and engineering firm.

G. R. Alexson, manager of Pasotex Pipe Line Co., has retired after 45 years with Standard Oil Co. of California affiliates. He had been manager of Pasotex Pipe Line since 1947.

Frank C. Colegrove, executive vice president of Allied Oil Co., a subsidiary of Ashland Oil & Refining Co., has been elected president of Allied. **John G. Clymer** has been elected vice president of Allied and will continue as manager of supply for the company. **William D. Baskett, Jr.,** executive vice president of Frontier Oil Refining Co., also an Ashland subsidiary, has been elected president of Frontier. He had been executive vice president of the company since 1952.

Deaths

A. H. Riney, 71, retired vice president in charge of engineering for Phillips Petroleum Co., died January 13 at his home in Bartlesville, Okla., after a long illness. Riney retired in 1951. He had been superintendent of construction and chief engineer for Phillips before being elected a vice president in 1939.

Arthur J. Rogers, 73, president and one of the founders of Navy Oil Co., Bakersfield, Calif., died January 8 at his home in Shell Beach, Calif.

Robert E. Bering, 63, California oil producer, died January 6 in Los Angeles after a long illness. Bering was an early developer in the Signal Hill field. He was part owner of Geyser Development Co.

Arthur L. Tower, 82, retired Richfield Oil Corp. plant superintendent, died January 3 in Los Angeles.

Thomas Giles Cain, 73, founder of Cain Rig Building Co., Wilmington, Calif., deid January 6 in Los Angeles. Cain is credited with building more than 7,000 oil derricks in California.

Samuel L. Lewk, 70, retired Amerada Petroleum Corp. land man, died January 12 in a Daytona Beach, Fla., hospital. Lewk was with Shell Oil Co. before joining Amerada.

Personals

Lewis A. Lapham, chairman of the executive committee of Bankers Trust Co., New York, and **Albert L. Williams,** executive vice president of International Business Machines Corp., have been elected directors of Socony Mobil Oil Co., Inc.

W. C. Smith and **Fred P. Sewell,** vice presidents of Delhi-Taylor Oil Corp., have been promoted to senior vice presidents of the company. They will work with the president in developing company policy and will act

SMITH

SEWELL

as group vice presidents coordinating the company's six operating divisions. Smith has been vice president in charge of production since 1950. Sewell has been vice president in charge of manufacturing.

James L. Wilson, regional operations manager for Atlantic Refining Co., has been elected chairman of the Houston chapter of American Petroleum Institute. He succeeds **B. O. (Duke) Ellington,** Baker Oil Tools, Inc. Other new officers include **Darrel Smith,** Texaco Inc., first vice chairman; **Ken R. Joynt,** Mobil Oil Co., second vice chairman; **W. W. Cathriner,** Dunwoody Pipe & Supply Co., secretary-treasurer; and **George H. Kimbrell,** Reed Roller Bit Co., assistant secretary-treasurer.

Jack G. Courtney, production engineer with Mobil Oil Co., has been transferred to Shreveport, La., from Drumright, Okla.

O. V. Tracy, president of Esso Standard division of Humble Oil & Refining Co., has been appointed a director of the Newark College Engineering Research Foundation.

Paul E. Stoll, manager of Sun Oil Co.'s Jackson, Mich., sales district, has been appointed manager of the company's new Owosso, Mich., district.

W. A. Grieves, group leader with Jersey Production Research Co., Tulsa, has been transferred to the drilling development division from the production division.

Robert W. Andrews, formerly with Prengle, Dukler & Crump, consultants, has joined Southwest Industries, Inc., as process engineer. **H. George Wernette,** formerly with Warren Petroleum Corp., has joined Southwest as sales engineer. **Thomas H. Ells,** formerly with Atlantic Refining Co., has joined the company's chemical engineering department.

Murray B. Quigles, Jr., assistant district drilling and production superintendent for Union Producing Co. in Houston, has been promoted to district drilling and production superintendent there. He succeeds **Quincy L. Henson,** who has retired. Quigles joined Union Producing in 1946. He had been field production and drilling superintendent in Shreveport, La., Houma, La., and Jackson, Miss., before moving to Houston in 1956.

MORERO

Joseph E. Morero, Skelly Oil Co.'s vice president in charge of geology and geophysics since 1951, has been elected a director of the company. Morero joined Skelly in 1926. He was chief geologist in Tulsa before being named a vice president and had been Gulf Coast and West Texas-New Mexico division geologist in Houston. Morero succeeds **W. K. Bullock** on the Skelly board.

Ray Butler, general superintendent of drilling and production for Harkins & Co., Alice, Tex., drilling firm, has been elected a vice president. He will be in charge of company-wide operations.

James C. Elmore, division engineer for Texas Eastern Transmission Corp. in Baytown, Tex., has been promoted to assistant division manager there. Elmore joined Texas Eastern in 1949.

John F. McCormick, Carter Division of Humble Oil & Refining Co., has been elected president of the Tri-State Landmen's Association. He succeeds **William J. A. Johnson,** Kewanee Oil Co. Other officers will be **Gene Cook,** V. J. Wilson Petroleum Co., vice president; and **Ed Litman,** Mobil Oil Co., secretary-treasurer. Executive committee members include Johnson, **W. V. Nations,** Cities Service Oil Co.; **Earl Baxter,** Superior Oil Co., and **Wilbur Smith,** Ohio Oil Co.

C. E. Neary, 56, Tulsa repair-parts manager for Cooper-Bessemer Corp., died January 10 in his Tulsa home after a heart attack. Neary had been with Cooper-Bessemer and predecessor companies since 1923.

Herbert H. James, 69, retired representative for Du Pont Co., died January 10 in a Tulsa hospital after an illness of several months. James had acted as liaison between Du Pont and Phillips Petroleum Co. before his retirement in 1955.

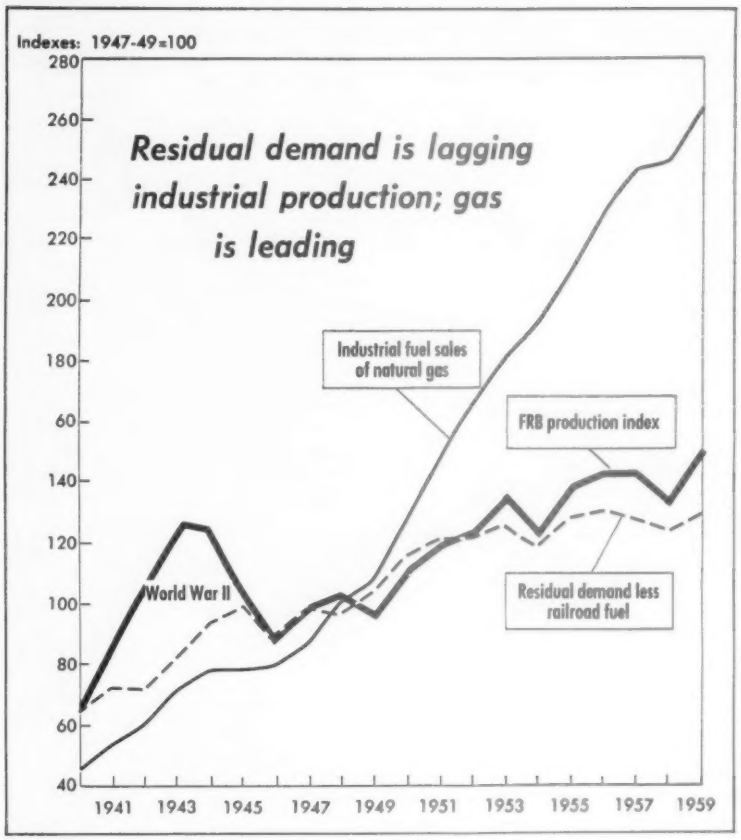
William O. Barnes, 59, eastern division employe relations manager for Tidewater Oil Co., died January 5 in a New York hospital. Barnes joined Tidewater in Avon, Calif., in 1925. He was personnel manager of the Avon refinery before moving to New York in 1955.

Milos E. Boehm, 72, retired general manager of Hughes Tool Co., died January 12 at his home in Houston. Boehm has been a consultant to Hughes Tool since his retirement in 1945. He was a pioneer in development of oil drilling rock bits during the early 1900's.

E. G. Stepp, 56, chief engineer in charge of United Fuel Gas Co.'s compressor operations for West Virginia, Kentucky, and Virginia, died recently at his home in Charleston, W. Va. He had been with the Columbia Gas System for 37 years.

John Allison da Costa, 77, retired general director for Standard Oil Co. (N. J.) in South America, died January 5 at his Redondo Beach, Calif., home. He retired from Jersey Standard last year.

James Edwin Hill, 63, Houston independent, and vice president and general manager of the Sid Richardson interests before Richardson's death last year, died January 7 at his Houston home. Hill entered the oil business with Shell Oil Co. in 1929 after graduation from the University of Oklahoma. He was chief division petroleum engineer for Shell before joining Sid Richardson in 1940. He began independent operations in Houston a year ago.



Gas replaces heavy fuel for industrial use

BY JOHN C. CASPER

DEMAND for residual fuel is lagging industrial production. Industrial gas sales are booming.

Residual is primarily an industrial fuel, and if it is holding its own in the market place, use should rise and fall with changes in industrial activity.

The Federal Reserve Board's index of industrial production is a good measure of this activity. It includes both durable and nondurable manufactures as well as minerals.

In past years there has been close correlation between this index and the use of residual fuel, after deducting railroad consumption. Railroad fuel, if left in the total, would tend to distort the normal growth pattern. In the twenties and early thirties, there was a rapid shift by the railroads from coal to residual fuel. This expanding market gave an abnormal boost to residual sales. This growth period was followed by another change, this time from residual to diesel fuel. Total sales of residual show the effect of these shifts.

The chart compares growth in general industrial production with sales of residual fuel and with industrial sales of natural gas.

Note the peak in the FRB index for the 1942-45 period. This bulge was due to abnormal production during World War II. Demands for industrial fuel could not be met from the available supply of residual, and many plants returned to coal.

For the postwar period until about 1952, there was a reasonable correlation between residual use and the FRB index. Since that time, residual demand has been falling behind.

There is evidence from the lines on the chart that natural gas stepped in to take over the expansion in the industrial market.

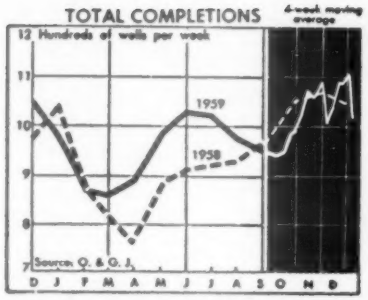
Only industrial-fuel sales of gas were included in the totals used to get the trend line for gas. These figures do not include field use of gas nor gas used in the production of carbon black. Remaining gas was plotted as an index with average sales for 1947-49 equal to 100.

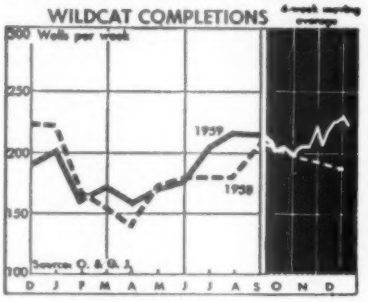
Note that gas sales tend to follow the general industrial production trend until the big gas lines were completed after World War II. But, starting with 1950, industrial gas has climbed so much faster than total industrial production that it must have replaced other fuels.

The booming line for gas and the leveling off by residual give a picture of the shift from heavy fuel to industrial gas.

A quick look at the highlights

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,159,390	UP	59,940	UP	97,929
Crude stocks	252,900,000	DOWN	2,554,000	DOWN	10,033,000
Completions	908	UP	72	DOWN	348
Refinery runs	8,396,000	UP	27,000	UP	151,000
Gasoline stocks	193,948,000	UP	4,982,000	UP	3,924,000
Kerosine stocks	26,705,000	DOWN	66,000	UP	1,342,000
Distillate stocks	143,031,000	DOWN	5,648,000	UP	23,924,000
Residual stocks	49,563,000	DOWN	375,000	DOWN	10,428,000
Four-product stocks	413,247,000	DOWN	1,107,000	UP	18,762,000
Total imports	1,709,300	UP	47,000	DOWN	147,400





Active Rotary Rigs

	1-11-60	1-4-60	1-12-59
Alabama	5	5	8
Arkansas	13	14	14
Arizona	0	0	0
California	77	78	88
Land	70	71	83
Offshore	7	7	5
Colorado	34	39	27
Florida	2	1	1
Land	2	1	1
Offshore	0	0	0
Illinois	26	34	39
Indiana	2	7	6
Iowa	0	0	3
Kansas	117	123	120
Kentucky	8	10	6
Louisiana	277	286	322
North	32	30	39
S. Inland waters	104	110	131
S. Land	89	95	116
Offshore	52	51	36
Maryland	0	0	2
Michigan	36	37	13
Mississippi	70	68	59
Missouri	1	1	0
Montana	20	18	17
Nebraska	19	24	14
Nevada	0	0	0
New Mexico	96	114	97
New York	0	0	0
North Dakota	22	25	32
Ohio	4	4	3
Oklahoma	174	188	200
Oregon	0	0	0
Pennsylvania	13	14	10
South Dakota	5	5	0
Texas	562	662	721
S. Inland waters	6	*6	142
S. Land	161	177	142
Offshore	0	*0	2
North-East	122	160	150
West Central	183	218	276
West	90	101	149
Utah	28	27	35
Washington	1	1	1
West Virginia	4	4	3
Wyoming	57	64	61
Total U. S.	1,673	1,853	1,902
Western Canada	223	223	189
Eastern Canada	5	1	0
Grand total	1,901	2,077	2,091

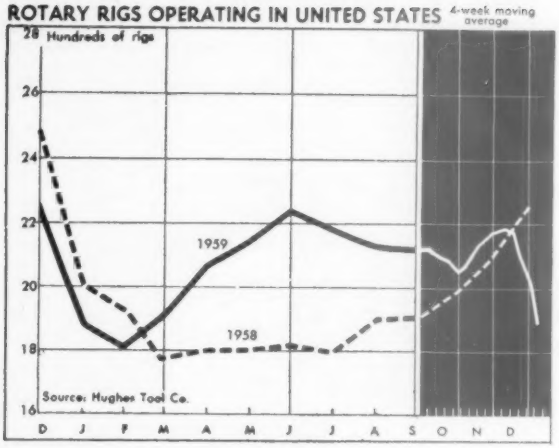
Hughes Tool Co. report. *Revised.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JANUARY 9, 1960

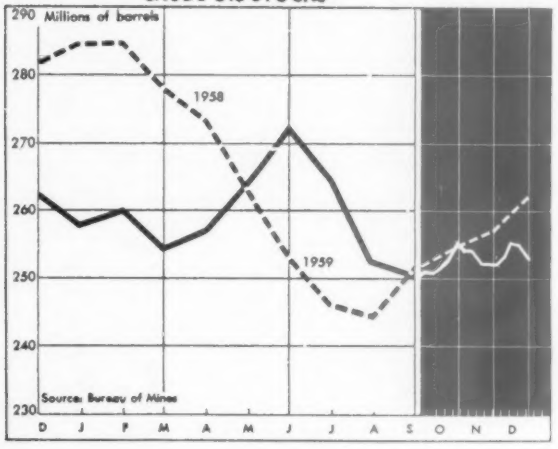
	Total wells						Footage	Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service		1960	1959	Total	Crude	Cond.	Gas	Dry	1960	1959
Alabama	1	1	0	0	0	0	3,443	1	7	0	0	0	0	0	0	2
Arizona	2	0	0	0	2	0	1,350	2	..	2	0	0	0	2	2	..
Arkansas	9	1	0	0	8	0	33,127	23	38	3	0	0	0	3	6	12
California	34	23	0	3	6	2	173,192	73	76	7	1	0	0	6	16	20
Colorado	16	1	0	2	13	0	86,225	16	25	12	0	0	1	11	12	12
Illinois	33	13	0	0	19	1	75,746	33	41	8	1	0	0	7	8	9
Indiana	32	16	0	0	16	0	54,776	32	22	8	0	0	0	8	8	7
Kansas	85	38	0	3	42	2	306,820	85	145	28	4	0	0	24	28	37
Kentucky	39	26	0	0	13	0	34,614	39	50	8	0	0	0	8	8	2
Louisiana	130	54	23	8	44	1	1,218,471	172	151	13	1	0	1	11	21	25
North	25	15	0	1	9	0	94,411	67	59	2	1	0	0	1	10	14
South	76	22	18	6	29	1	823,521	76	81	10	0	0	1	9	10	10
Offshore	29	17	5	1	6	0	300,539	29	11	1	0	0	0	1	1	1
Michigan	12	7	0	0	5	0	44,515	29	18	2	0	0	0	2	7	4
Mississippi	17	8	3	0	5	1	158,517	36	35	6	1	0	0	5	15	19
Montana	11	5	0	0	6	0	52,020	11	14	6	1	0	0	5	6	5
Nebraska	25	9	0	0	16	0	151,150	25	24	9	4	0	0	5	9	11
New Mexico	0	0	0	0	0	0	0	42	55	0	0	0	0	0	3	7
West	0	0	0	0	0	0	0	17	..	0	0	0	0	0	0	..
East	0	0	0	0	0	0	0	25	..	0	0	0	0	0	3	..
New York	3	0	0	1	2	0	7,716	3	9	2	0	0	0	2	2	1
North Dakota	6	2	1	0	3	0	46,470	6	15	1	0	0	0	1	1	3
Ohio	6	3	0	2	0	1	16,108	58	22	0	0	0	0	0	2	2
Oklahoma	94	39	9	6	40	0	362,324	94	200	21	1	2	2	16	21	44
Pennsylvania	6	0	0	4	2	0	40,836	6	0	2	0	0	0	2	2	0
South Dakota	1	0	0	0	1	0	660	2	..	1	0	0	0	1	2	..
Texas	288	126	27	19	116	0	1,493,752	549	696	68	2	4	3	59	136	165
Dist. 1	44	13	3	2	26	0	126,750	65	80	19	1	0	0	18	28	17
Dist. 2	21	8	4	4	5	0	144,768	43	52	4	0	1	1	2	11	15
Dist. 3	33	15	4	1	13	0	232,500	69	54	11	1	0	0	10	17	19
Dist. 4	76	17	11	9	39	0	361,603	107	91	20	0	3	2	15	28	30
East	57	24	5	0	28	0	334,746	57	41	14	0	0	0	14	14	15
Dist. 7-B	0	0	0	0	0	0	0	33	73	0	0	0	0	0	12	24
West	57	49	0	3	5	0	293,385	92	176	0	0	0	0	0	13	22
Dist. 9	0	0	0	0	0	0	0	73	75	0	0	0	0	0	11	14
Dist. 10	0	0	0	0	0	0	0	10	54	0	0	0	0	0	2	9
Utah	4	0	0	1	3	0	21,682	4	7	2	0	0	0	2	2	3
West Virginia	24	0	0	20	4	0	70,213	24	36	1	0	0	0	1	1	1
Wyoming	29	13	0	0	16	0	141,474	29	29	15	2	0	0	13	15	13
Misc. (Oregon)	1	0	0	0	1	0	2,627	3	5	1	0	0	0	1	3	4
Total U. S.	908	385	63	69	383	8	4,597,828	1,397	1,720	226	18	6	7	195	336	408
Previous week	836	343	25	99	325	44	3,161,877	.....	.....	185	12	0	6	167	.....	.....
Cum. 1960	1,397	573	88	124	575	37	6,707,730	.....	.....	336	24	6	8	298	.....	.....
Cum. 1959	1,720	799	48	113	722	38	7,474,562	.....	.....	408	45	10	11	342	.....	.....
Western Canada	114	75	0	10	27	2	648,789	185	.....	29	7	0	5	17	47	.....

PRODUCTION

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	1-2-60	12-26-59	1-3-59
Pennsylvania	2,283	2,380	2,585
Other Appalachian	1,492	1,261	1,684
Illinois, Indiana, Michigan	10,108	9,574	10,292
Nebraska and North Dakota	3,245	3,343	2,184
Kansas	9,688	9,880	10,035
Oklahoma	16,916	16,731	17,040
Arkansas	2,240	2,011	2,302
Louisiana	17,942	17,428	17,233
North	3,297	3,213	3,072
South	14,645	14,215	14,161
Mississippi, Alabama, Florida	2,577	2,408	2,482
New Mexico	8,049	7,952	8,082
Texas	109,650	112,280	116,886
East Texas	8,056	7,785	8,560
West Texas	51,343	52,906	56,153
Texas Gulf	20,589	21,586	20,732
Other Texas	29,662	30,003	31,441
Wyoming	16,795	16,988	13,247
Other Rocky Mountain	9,627	9,608	9,225
California	28,792	28,973	34,819
Foreign	†13,496	14,637	14,837
Total	**252,900**	255,454	262,933

*Bureau of Mines. †Includes 4,957,000 bbl. in California.

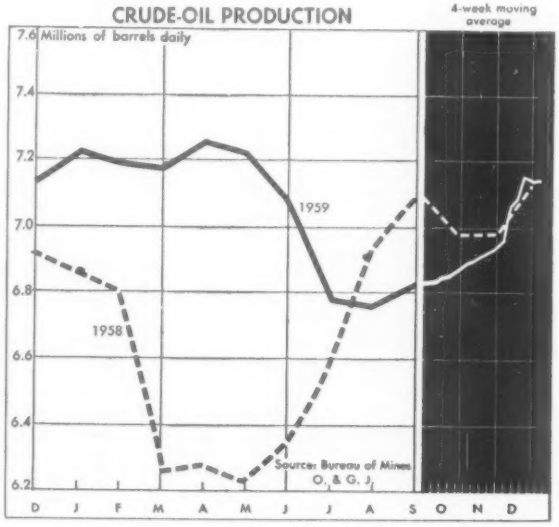
DAILY AVERAGE PRODUCTION FOR WEEK

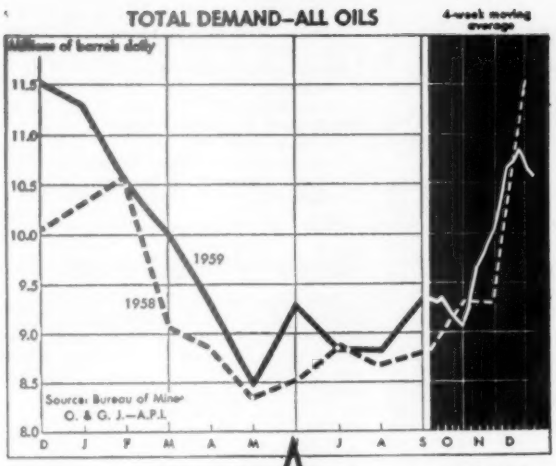
	January 9, 1960			Jan. 2
	Crude oil	Lease condensate	Total	total
Alabama	16,000	.....	16,000	16,000
Arkansas	83,000	150	83,150	82,160
California	835,300	.....	835,300	837,500
Colorado	130,000	.....	130,000	129,800
Eastern	41,700	.....	41,700	42,500
Florida	1,150	.....	1,150	1,170
Illinois	215,000	.....	215,000	218,400
Indiana	31,400	.....	31,400	31,400
Kansas	†306,470	.....	†306,470	†304,390
Kentucky	75,000	.....	75,000	74,300
Louisiana	947,000	123,100	1,070,100	1,046,150
North	107,000	5,600	112,600	113,150
South	840,000	117,500	957,500	933,000
Michigan	32,300	.....	32,300	34,400
Mississippi	141,850	4,870	146,720	145,970
Montana	81,600	.....	81,600	80,400
Nebraska	64,000	.....	64,000	63,500
Nevada	100	.....	100	100
New Mexico	292,600	6,800	299,400	296,100
North Dakota	60,000	.....	60,500	62,000
Oklahoma	†550,000	.....	†550,000	†533,700
Texas	2,584,000	81,000	2,665,000	2,647,200
Dist. 1	40,000	3,000	43,000	46,000
Dist. 2	112,000	8,900	120,900	118,800
Dist. 3	340,000	37,000	377,000	372,000
Dist. 4	179,000	9,800	187,800	189,800
Dist. 5	27,000	400	27,400	26,400
Dist. 6	111,000	9,400	120,400	116,500
East Texas field	142,000	.....	142,000	141,000
Dist. 7-B	135,000	180	135,180	128,180
Dist. 7-C	123,000	3,620	126,620	128,320
Dist. 8	1,074,000	5,200	1,079,200	1,064,000
Dist. 9	193,000	2,100	195,100	207,200
Dist. 10	108,000	1,400	109,400	109,000
Utah	109,450	.....	109,450	110,000
Wyoming	344,600	.....	344,600	342,000
Others	‡450	.....	‡450	‡310
Total U. S.	6,943,470	215,920	**7,159,390**	7,099,450
Change from prev. week, up			**59,940**	
Canada	†475,400	.....	†475,400	†528,000

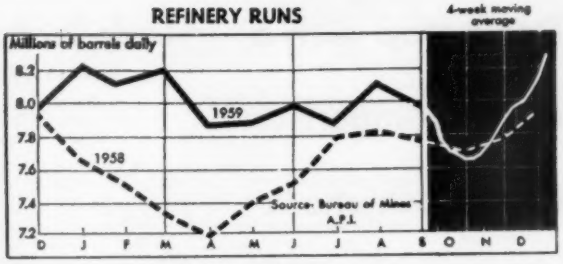
Total U. S. prod., January 1-January 9 ..... 64,314,630 bbl.
Same period last year (crude plus cond.) ..... *70,830,259 bbl.

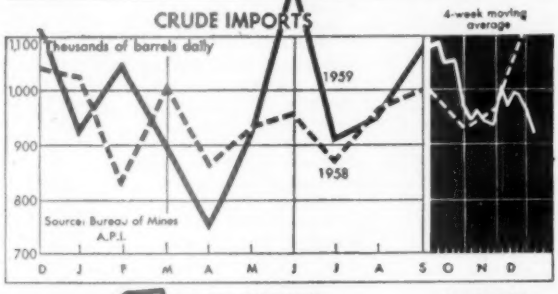
*Includes 1,820,925 bbl. condensate. †Week ended previous Monday. ‡Arizona, South Dakota, and Washington.

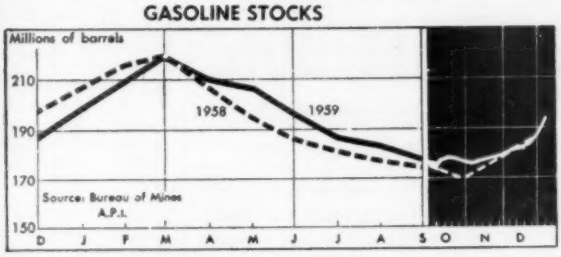
CRUDE-OIL PRODUCTION

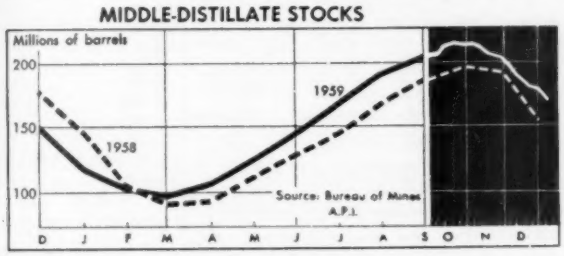


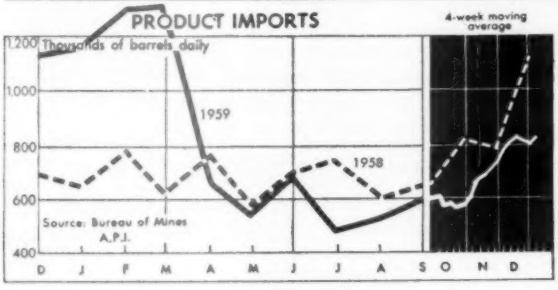


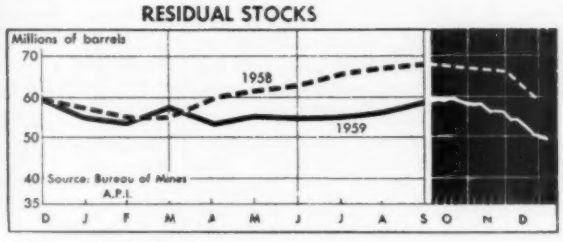












API REFINERY REPORT—JANUARY 8, 1960

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, January 1959 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,129	499.7	14.1	411.4	150.3	41,676	11,217	55,732	10,506	1,195	550.9	45.4	416.3	225.8
Appalachian:														
District 1	100	40.1	5.6	23.4	11.7	6,033	661	3,838	337	97	39.7	6.5	21.5	11.9
District 2	109	61.6	7.7	18.0	21.0	3,063	456	1,573	435	114	57.4	7.3	20.0	18.6
Ind., Ill., Ky.	1,615	805.4	92.0	355.7	213.6	33,811	5,865	23,499	5,289	1,512	738.9	80.0	359.6	223.2
Minn., Wis., Dak.	120	59.2	7.7	26.0	171.	7,577	1,120	6,796	655	108	52.4	6.4	28.4	14.6
Okla., Kans., Mo.	750	405.3	16.3	200.6	277.	18,848	1,217	10,701	1,223	770	416.0	22.7	210.0	40.8
Inland Texas	306	219.3	7.6	51.7	19.7	7,331	426	1,753	2,402	278	183.9	8.8	48.3	21.7
Texas Gulf Coast	1,929	990.7	128.7	424.5	184.4	24,012	2,538	15,498	4,932	1,961	979.2	142.9	564.9	182.2
La. Gulf Coast	713	371.0	99.0	171.7	58.1	11,221	1,974	5,593	1,079	699	343.6	81.2	184.5	50.4
N. La. and Ark.	103	44.0	6.8	21.3	9.9	5,360	555	2,432	263	92	45.3	5.8	19.1	5.8
Rocky Mountain:														
New Mexico	26	15.4	0.6	4.7	2.7	849	55	207	81	24	11.3	0.6	4.6	2.4
Other R'cky Mt.	298	141.3	2.9	67.7	32.9	5,981	212	2,512	1,132	287	136.4	4.2	62.8	37.5
West Coast	1,198	522.7	1.1	197.7	285.2	28,186	409	12,897	21,229	1,093	502.5	6.9	193.0	281.9
Jan. 8, 1960	8,396	4,175.7	390.1	1,974.4	1,034.3	193,948	26,705	143,031	49,563	8,230	4,057.5	418.7	2,133.0	1,116.8
Jan. 1, 1960	8,369	4,230.4	459.4	2,018.4	§991.3	188,966	26,771	§148,679	49,938	.....	.....	.....	.....	.....
Jan. 9, 1959	8,245	4,098.4	443.1	2,076.0	1,078.4	190,024	25,363	119,107	59,991	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines. §Revised.

Don't stop with a single comparison on a stock check

MARKETERS are paying too much attention to year-to-year stock changes when they make decisions on supply and prices.

Distillate prices moved up 0.5 cent a gallon on the East Coast early in January. The resulting price of 10.10 cents a gallon for barge delivery in New York Harbor is the lowest January 4 price since 1955. This means that the new price is still too low if some consideration is given to increased crude and processing costs since early 1955. But, the selling price of a product is the final negotiated result of bargaining between buyer and seller.

Too many suppliers are taking a look at Gulf-East Coast distillate stocks and comparing them with totals for this time last year without giving due consideration to changed conditions.

Gulf-East Coast distillate stocks are much higher than last year, but the reduction in distillate stocks in December 1958 was abnormal.

At the first of this year, Gulf-East Coast distillate stocks showed a gain of 18,184,000 bbl. or 29% over the total reported a year earlier. But, that low inventory level at the end of 1958 was due to abnormally cold weather in December.

And, Gulf-East Coast distillate stocks at the end of 1958 represented a decrease of 20,579,000 bbl. from the total reported for the end of 1957. The current buildup of distillate inventories represents a return to the stock position that existed at the end of 1957.

Suppliers also took a look at stocks back in January 1958 and cut distillate prices in the last half of the month. The irony of that price reduction was that the mild January was followed by a cold February and distillate demand was good.

Gulf-East Coast distillate stocks dropped over 23,000,000 bbl. in February 1958, but it was too late in the season for prices to reflect the gain in demand. It was the weather, not the drop in price, that contributed to the increase in demand that month.

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill, Calif.	Okla-homa	Gulf Coast Tex.*	West Tex.† N.M.	Wyo. (sour)
14-14.9	$1.76	....	....	....	....
15-15.9	1.84	....	....	....	$1.81
16-16.9	1.92	....	....	....	1.86
17-17.9	2.00	....	....	....	1.91
18-18.9	2.08	....	....	....	1.96
19-19.9	2.16	....	....	....	2.01
20-20.9	2.24	$2.49	....	$2.35	2.06
21-21.9	2.32	2.52	....	2.38	2.11
22-22.9	2.39	2.55	....	2.41	2.16
23-23.9	2.46	2.58	$3.44	2.44	2.21
24-24.9	2.53	2.61	3.46	2.47	2.26
25-25.9	2.60	2.64	3.48	2.50	2.31
26-26.9	2.67	2.67	3.50	2.53	2.36
27-27.9	2.74	2.70	3.52	2.56	2.49
28-28.9	2.81	2.73	3.54	2.59	2.54
29-29.9	2.87	2.76	3.56	2.62	2.59
30-30.9	2.93	2.79	....	2.65	2.63
31-31.9	3.00	2.82	....	2.68	2.67
32-32.9	3.06	2.85	....	2.71	2.71
33-33.9	3.12	2.88	....	2.74	2.75
34-34.9	3.17	2.91	....	2.77	2.79
35-35.9	3.22	2.94	....	2.80	2.83
36-36.9	3.27	2.97	....	2.83	2.87
37-37.9	3.31	2.99	....	2.86	2.89
38-38.9	....	3.01	....	2.89	2.91
39-39.9	....	3.03	....	2.92	2.93
40-40.9	....	3.05	....	2.95	2.95

*Low cold test crude. †Sour.

Effective dates of broad changes: California, 9-11-59; East of California, January 3-10, 1957; Pennsylvania Grade 1-11-60.

FLAT PRICES

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.05-3.25
Conroe	3.23-3.53
Van	3.08
Pennsylvania Grade:	
★ Bradford	4.55
★ Middle District	4.37
★ Southwest Pennsylvania	4.10
★ West Virginia	3.92
★ Buckeye Grade	3.97
Illinois Basin	**3.00**

FOREIGN

Canada:	
Leduc-Woodbend	2.53
Redwater (Alta.)	2.42
Smiley (Sask.)	2.18
Pembina	2.38
Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.34
San Joaquin, 41°-41.9°, Puerto La Cruz	3.08-3.10
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes f.o.b. lifting port):	
Arabian, about 34°, Ras Tanura	$1.89
Iranian, 34.0°-34.9°, Bandar Masur	1.80
Iranian, 34.0°-34.9°, Abadan	1.81
Iraq, 36.0°-36.9°, Fao	1.82
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.67
Qatar, about 41°, Um Said	2.05
Middle East, E. Mediterranean:	
Arabian, about 35°, Sidon	2.29
Iraq, about 35°, Tripoli, Banias	2.29
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.57

Refined-Product Prices

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
★ Regular (91 octane)	9.75-10.00
★ Premium (99 octane)	12.25-12.50
Natural gasoline (26-70)	4.5
Breckenridge	4.0
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	10.25-10.50
Regular (92 octane)	10.50-10.75
Premium (98 octane)	11.75-12.00
California (rack) Los Angeles):	
Regular (88 octane)	11.65-12.15
Premium (94 octane)	12.65-13.15
Premium (100 octane)	14.00-14.65
Caribbean area (cargoes):	
Regular (87 octane)	10.125
Premium (97 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	10.50-10.75
Diesel oil (58 d.i. and above)	10.25
Distillate No. 1	10.25-10.50
Distillate No. 2	9.50
Gulf Coast (cargoes):	
Kerosine 41-43	9.50
★ Distillate No. 2	8.625
New York Harbor (barges):	
Kerosine 41-43	11.10
Distillate No. 2	10.10
Diesel fuel, 48-52 d.i.	10.40
Caribbean area (cargoes):	
★ Distillate No. 2	8.375-8.675

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max 1% S)	$1.80-1.90
Gulf Coast (cargoes):	
Bunker C fuel	$2.00
New York Harbor (barges):	
Bunker C fuel	$2.37
Caribbean (cargoes):	
Bunker C	$2.00
California (rack):	
Bunker C fuel, Los Angeles	$2.15

Tanker Rates (Long Ton)

(Latest reported spot fixtures)

★ Gulf-USNH, clean (ATRS—2.5%)	$2.78
Gulf-USNH, dirty (ATRS Flat)	2.85
Carib.-USNH, dirty (ATRS —40%)	1.65
★ PG-UK, dirty (Scale —42.5%) (33s. 9d.)	4.73

★ Denotes change from previous week.

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1—1410 HP, 400# inlet, 26 in. vacuum exhaust.
10—1 to 60 HP, 400# inlet, 26 in. vacuum to 30# exhaust.
7—120 to 290 HP, 400# inlet, 30# to 135# exhaust.
10—5 to 55 HP, 135# inlet, 0 to 25# exhaust.
6—75 to 170 HP, 135# inlet, 25 in. vacuum to 25# exhaust.

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1—PITTSBURGH Automatic Lectrodryer unit, standard model BY-1-R dual absorber type, fully automatic. Max WP 150#. Seamless vertical tank, ASME construction, 500 deg. F. max temp.

37—Tanks-Drums-welded-riveted-various cap; 14 Bbls. to 40,000 Bbls.

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Quan.	Tubes	Sq. Feet
22	Steel	202-2205
42	Admiralty	170-2060
10	Chrome	212-1580
4	Brass	460-840
1	Chr-Moly	355

TOWERS

Quan.	Size	Trays
1	7' x 40'2"	14
1	9' x 40'2"	10
1	10' x 40'2"	3
1	5'6" x 38'3"	14
1	6'6" x 38'6"	6
1	12' x 73½"	31
1	5' x 31'¼"	8
1	3' x 42"	12

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Chemical Engineer Degree with at least 3 years experience in gas products plant process design, including estimating costs, making computations, preparation of reports and specifications for products, materials, and equipment.

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WANTED BY Refiner, man combining substantial experience, petrochemical manufacture and sales to spearhead entry into petrochemical field. Good opportunity for right man. Gulf Coast Area. Box L-665, The Oil and Gas Journal, Tulsa, Oklahoma.

INDEPENDENT, INLAND, Southwestern Refiner has opening for Salesman-Sales Manager. Party should have knowledge of petroleum wholesale and retail marketing with successful background. In reply give education and business experience in chronological order. State age, family status, present and expected income. Include photograph. All replies held confidential with corporation president. Box L-656, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPLORATION GEOLOGIST

with minimum of six years experience in Permian Basin of West Texas. Applicant must be able to do original work and generate prospects. Position is available in Denver, Colorado. Please send complete resume to Superintendent of Exploration,

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P. O. Box 2732 Denver 1, Colorado.

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Large independent integrated oil company has two or three supervisory operating positions open. Must have mechanical or petroleum engineering degree. Prefer from three to twelve years experience in all phases of drilling and/or production operations. Submit full resume along with transcript of grades if possible.

BOX L-632
THE OIL AND GAS JOURNAL
TULSA, OKLAHOMA

GROWING ARKANSAS Refinery needs graduate Chemist or Chemical Engineer. Five to ten years Lube or Asphalt experience preferred. Submit experience, degree, and transcript of grades. Box L-657, The Oil and Gas Journal, Tulsa, Oklahoma.

IMPORTANT POSITION offered in France for reservoir engineer with minimum six years experience. Knowledge of French preferable. Box L-653, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Experienced oil field supply salesman for Southern Michigan area. Position available immediately. Salary, car, expense account. Independent supply store. Reply to: Box L-645, The Oil and Gas Journal, Tulsa, Oklahoma.

NEW OIL JOB Directory, foreign and domestic, showing where to apply for jobs. 500 selected producing, refining, butane and pipeline companies. Nationwide, $6.00 cash. OIML Co., Box 2603, Tulsa, Oklahoma.

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WANTED: Man experienced with oil field equipment and supplies, required as inside store manager to handle calls, paper work, customers, etc. Salary open. Southern Michigan location. Reply to: Box L-646, The Oil and Gas Journal, Tulsa, Oklahoma.

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in Midcontinent area of Oklahoma and Kansas. The experience and ability to plan and execute an active exploration program for a substantial independent company is required for this opening. All replies will be considered confidential. Please send personal summary complete with a detailed history of experience to:

The Oil and Gas Journal,
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SITUATIONS WANTED

GEOLOGIST, executive with recently sold company, desires to form working association with an individual, financial group, or independent interested in West Texas-New Mexico or other areas. Box L-659, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST—Eleven years with Major Ark., La., Tex., & Miss. desires employment with smaller, more active company. Box L-660, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST—33, M.S., 8 years foreign and domestic experience. Desires foreign work. Resume on request. Immediate availability. Box L-667, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST-Production Superintendent: Age 35, married, conscientious. 10 Years Experience in Assembling Acreage, Exploration, Completions and Workovers. Will delineate meritorious prospects, supervise drilling completion and developmental program. Why pay double? Box L-651, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATION WANTED

GEOLOGIST: 32, 10 years on and offshore Gulf Coast, Texas, Louisiana and Ark-La-Tex experience including sub-surface, seismic, stratigraphic, evaluation, checking and finding deals. Wide range of contacts. Box L-661, The Oil and Gas Journal, Tulsa, Oklahoma.

THOROUGHLY EXPERIENCED contracts, leases, titles, damages, right of way. Licensed attorney Texas, Oklahoma. Will relocate with producing and/or pipeline organization. Available February First. Box L-662, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE ENGINEER with broad experience in natural gas business including operations and rates, also several years with F.P.C. (certificates and rates), is desirous of changing position. Box L-664, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM GEOLOGIST, age 36, 10 years experience, primarily Mid-Continent Area, capable of evaluating areas and generating prospects, best references. Complete resume upon request. Louis McPherron, 402 Masonic Building, Shawnee, Oklahoma.

PETROLEUM ENGINEER (BS)—24, single, seeks employment. Will be discharged from Army in April. Locate anywhere. 15 months diversified experience. Resume and recommendations. Box L-652, The Oil and Gas Journal, Tulsa, Oklahoma.

SALESMAN—41, Marketing major, 10 years experience, knowledge of petro-chemicals, oil production equipment. Excellent references. Box L-647, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST—14 years Exploration and Development Geology, Land, Drilling, Production and Appraisal Experience. Can successfully supervise a one well or five hundred well program. Box L-654, The Oil and Gas Journal, Tulsa, Oklahoma.

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FINANCIAL Contacts, Underwriters, Private Brokers reached. No shopping. Confidential. Send details to Consultant—817—51st Street, Brooklyn, N. Y.

FOR SALE—Texas corporation (Oil exploration and drilling) with medium to high six figure tax loss, oil production and 2 excellent rotary rigs. Stockholders wish to sell, though might consider merger. Ideal vehicle for small group with production who wish to expand. Box L-669, The Oil and Gas Journal, Tulsa, Oklahoma.

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BOX L-625
THE OIL AND GAS JOURNAL
TULSA, OKLAHOMA

LEASE AND DRILLING BLOCKS

WATERFLOOD PROSPECT—Eastern Kansas. 12 BOPD Settled Production. Core Analyses and Engineering Report. Box L-658, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL AND GAS MINERAL LEASES available in Dell City area of Hudspeth County, Texas. U. S. Geological Survey Map shows anticlinal axis nearby favorable for oil-gas structure. Am fee landowner of over 2,000 acres. Write quickly to: Jefferson G. Smith, 715 Littlefield Building, Austin 15, Texas.

LEASE AND DRILLING BLOCKS

WATER FLOOD Franklin County, Kansas. 640 acres, good engineering and best equipment, modern in every respect. Wonderful potential, good reason for selling. No brokers. Unless you are financially responsible do not reply. Box L-326, The Oil and Gas Journal, Tulsa, Oklahoma.

5,000 ACRES CLINTON County, Kentucky near recent shallow discovery well produced over 1,000 bbl./24 hrs., good geology on productive trend. Farmout or sell acreage. P. O. Box 1189, Lexington, Kentucky.

5,000 ACRES offset production, Wayne and Holmes Counties, Ohio. Will sell all or part. Write, Box 864, Hammond, Indiana.

FIVE WELLS, 15 BOPD settled production. Osage County, Oklahoma. Additional locations. Excellent equipment. By owner. Box L-638, The Oil and Gas Journal, Tulsa, Oklahoma.

ROYALTY UNDER actively developing waterflood—Okmulgee County, Oklahoma. Engineering report and core analyses. Box L-649, The Oil and Gas Journal, Tulsa, Oklahoma.

50% undivided 40 acres oil, gas & mineral rights Kern County, Calif. Near Shafter & Wasco. 33-1/3 acres, undivided, Caddo County, Okla., near Chickasha. Box 31 R 583, The Oil and Gas Journal, 4041 Marlton Ave., Los Angeles, Calif. Owner CLeveland 5-5672.

FOR SALE—160-acres Oil and Gas Lease offset to 100 bbl. Well Bartlesville Sand 1,300 feet four other producing sands. NE Oklahoma. Box L-666, The Oil and Gas Journal, Tulsa, Oklahoma.

SUBJECT: Biggest deal left in Kentucky Blue Sand. In Taylor County, over 1,000 acres, production on 3 sides, biggest lease offset well 200 barrels a day at 450 feet deep, over 100 new wells in area adjoining block.

Need good oil organization with drilling money to develop this proven acreage immediately. Over 50 feet of pay reported on adjoining acreage. Some money plus carried working interest. Box L-644, The Oil and Gas Journal, Tulsa, Oklahoma.

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THE OIL AND GAS JOURNAL
P. O. Box 1260 Tulsa, Okla.

(Continued from page 149)

Here's a rundown on Alaskan activity

DRILLING REPORTS in Alaska give the following information on current activity in the new state.

• In the Koyukuk basin, Benedum & Associates 1 Nulato, in the mountains west of the Yukon River in the west-central part of the state, was down to 1,659 ft. the first week of January.

• On the Kenai Peninsula, Standard-Richfield 41-4 Soldatna Creek Unit was spudded December 31. Drilling is down below 3,000 ft. This wildcat is located southwest of Swanson River Unit in the NE¼ NE¼ 4-7n-9w. This unit was approved by the USGS in December. It contains 70,720 acres.

• At Swanson River, 14-27 Swanson River was spudded December 26. Drilling is below 3,000 ft. Rig repairs have stopped operations, however.

The 32-22 well at Swanson River went to 11,774 ft. and was dry. This is the year's first completion in Alaska. The well is currently being redrilled from 4,705 ft. to a location in the NE¼ SW¼ 22, about 2,000 ft. to the southwest of the surface location. The new name is 23-22.

• In the Yakataga basin, Richfield Oil Corp. 1 Kaliakh on the Gulf of Alaska was at 5,738 ft. the first of January.

• On the Kenai Peninsula, Micel T. Halbouty recently got approval for a new 38,557-acre unit in the East Forelands area between Swanson River and Union-Ohio's Kenai Unit. The Bishop Creek Unit well will be spudded in the NW¼ NW¼ 11-7n-11w. Halbouty's other well was in 6-7n-9w. It was a 1959 dry hole at 12,037 ft.

Big condensate flow at Oklahoma test

Rich gas-condensate flows were reported at a field well at West Shattuck, Ellis County, northwestern Oklahoma. The big well is Oklahoma Natural Gas Co.'s 1 Gibbs in C SE NW 19-21n-25w.

Flow from lower Morrow Pennsylvanian perforations at 9,805-18 ft. was 2 M.M.c.f.d., at 9,902-30 ft., 4,002 M.c.f.d. at 9,960-67 ft. From 9,244-56 ft. in upper Morrow the flow was 600 bbl. of condensate and 5,500 M.c.f.d.

ADVERTISERS in this issue

A

ACF Industries, Incorporated, W-K-M Division ... 125
American Cyanamid Company, Refinery Chemicals Department ... 34
Anderson Company, The V. D. ... 146
Appleton Electric Company ... 4

B

Babcock & Wilcox Company—Tubular Products Division, The ... 36
Baker Oil Tools, Inc. ... 38
Bendix Aviation Corporation ... 14
Bethlehem Steel Company ... 100, 101

C

Caterpillar Tractor Co. ... 33
Classified Advertising ... 159, 160, 161, 162
Colorado Fuel and Iron Corp. ... 10
Columbus Hotel, The ... 112
Continental - Emsco Company, a Division of the Youngstown Sheet and Tube Company ... 11
Cook Machinery Co., Inc. ... 143

D

Darling Valve and Mfg. Co. ... 29
Delta Air Lines ... 141
Delta Tank Manufacturing Co., Inc. ... 63
Dow Corning Corporation ... 19
Dowell ... 35, 132, 133
Drilling Equipment Manufacturing Co. ... 127

E

Electric Machinery Mfg. Company ... 35
Ethyl Corporation ... 84, 85

F

Farris Engineering Corp. ... 96
First National Bank of Shreveport, The ... 31
Fisher Governor Company ... 12

G

Gates Rubber Co., The ... 32
General American Transportation Corporation ... 18
Goodyear Tire & Rubber Company, The ... 5
Grant Oil Tool Company ... 147
Guiberson Corporation ... 122

H

H & M Pipe Beveling Machine Co. ... 33
Halliburton Oil Well Cementing Co. ... 13, 27, 130
Hudson Engineering Corporation ... 65
Huey & Co., S. E. ... 105
Hughes Tool Co. ... Back Cover

I

International Business Machines Corporation ... 28
International Nickel Company, Inc., The ... 40

J

Jefferson Chemical Company, Inc. ... 20
Jones & Laughlin Supply Division ... 6, 7

K

Kansas Paint & Color Co. ... 31

L

Lane-Wells Company ... Inside Front Cover
Larkin Packer Company, Inc. ... 129
Leland Equipment Company ... 142
Lone Star Steel Company ... 94, 95
Lummus Company, The ... 3

M

Magnet Cove Barium Corp. ... 55
Maloney - Crawford Tank and Manufacturing Co. ... 117
Masterseal Company ... 145
Mission Mfg. Company ... 119
Mueller Co. ... 22, 23

N

National Bank of Tulsa ... 15
National Tank Company ... 164
Norris, Manufacturer, Inc., W. C. ... 120, 146

O

Oil Well Supply Division ... 2

P

Peerless Pump Division of Food Machinery & Chemical Corporation ... 66
Penberthy Manufacturing Company, Division of Buffalo-Eclipse Corporation ... 106
Petroleum Contractors Corp. ... 117
Petroleum Electric Power Assn. ... 16
Philco Corporation ... 17
Plastic Applicators Inc. ... 110

R

Republic National Bank of Dallas ... 117
Robbins & Myers, Inc. ... 111
Rockwell Manufacturing Company ... 115
Roper Hydraulics, Inc. ... 108
Rowco Mfg. Co., Inc. ... 144

S

Simmons-Boardman Books ... 105
Smith Tool Co. ... 126
Southwest Industries, Inc. Inside Back Cover
Southwestern Industrial Electronics Company, A Division of Dresser Industries, Inc. ... 121
Standard Magnesium Corporation ... 142
Stauffer Chemical Company ... 25
Sunshine Iron Works ... 112

T

Templeton, Kenly & Co. ... 112
Texas Employers Insurance Association ... 21
Texsteam Corporation ... 124
Thompson Tank & Mfg. Co., Inc. ... 31
Thompson Tool Co. ... 109
Tinker & Rasor ... 116

U

United States Borax & Chemical Corporation ... 148
United States Steel Corporation—Oil Well Supply Division ... 2
[illegible]al Oil Products Company ... 8, 9

V

Victaulic Co. of America ... 30

W

Wagner Electric Corporation ... 24
Walker Co., W. L. ... 127
Walworth Co. ... 1
Warner Lewis Company ... 87
Well Equipment Mfg. Corp. ... 128
Well Reconnaissance, Inc. ... 144
Western Company, The ... 83
Western Supply Company ... 90
W-K-M Division of ACF Industries Incorporated ... 125
Wyandotte Chemicals, Michigan Alkali Division ... 114

Z

Zink Company, John ... 113

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WORKING PRESSURE: 600 PSI. Test Pressure 1200 PSI.

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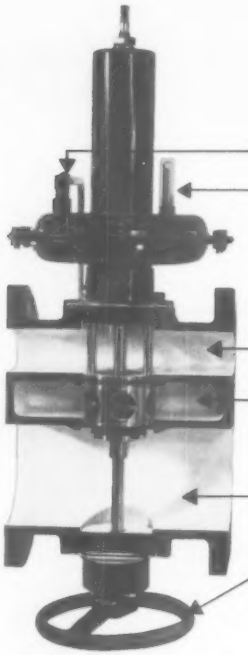
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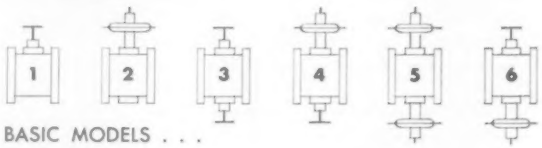

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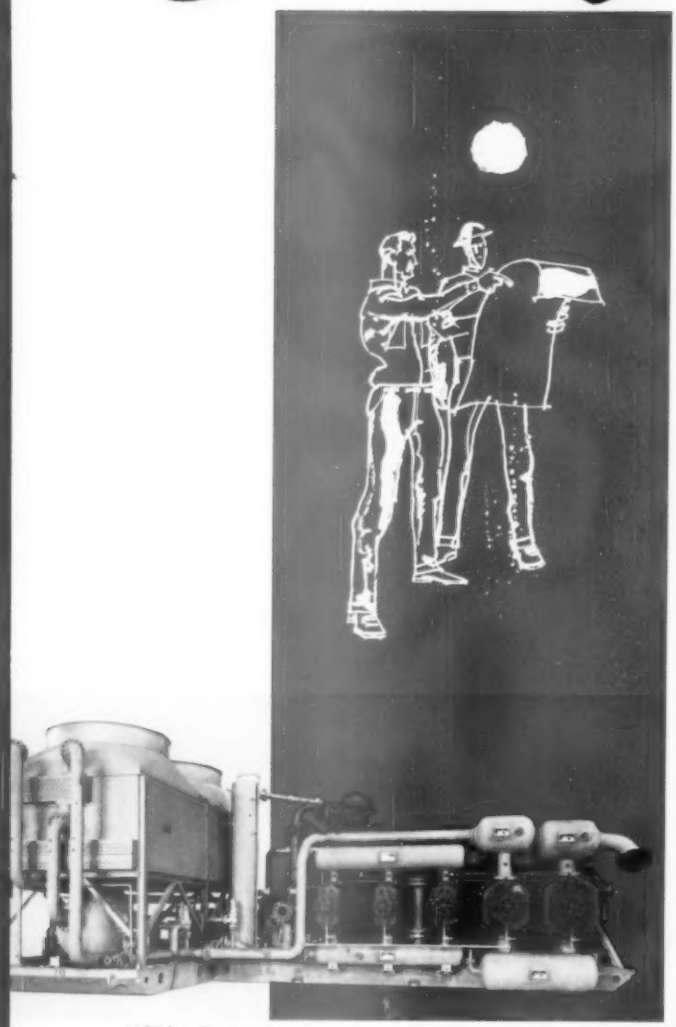

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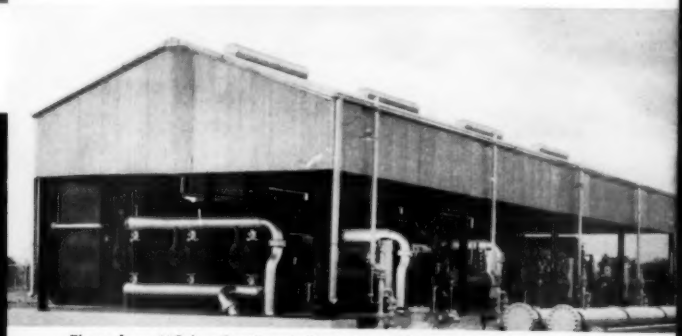

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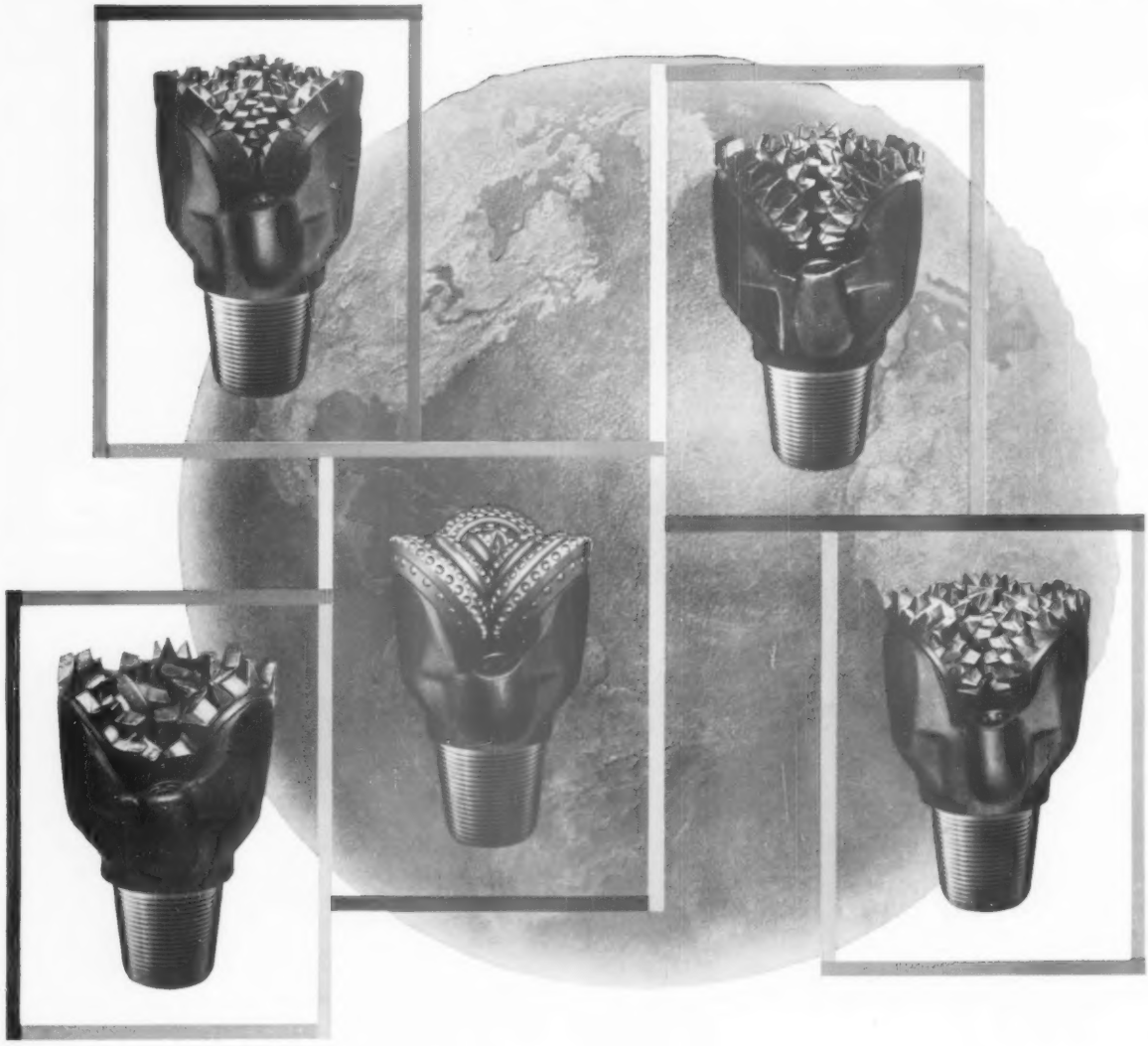

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